

**2011-12    2012-13**

**GRADUATE SCHOOL  
CATALOG**

## ACADEMIC CALENDAR FOR GRADUATE SCHOOL

2011-2012

### Fall Semester 2011

Registration	August 17
Orientation	August 17
Classes Begin	August 22
Last day to register for Fall Semester	August 24
Labor Day Holiday	September 5
Veterans Day Holiday	November 11
Last day to drop a class	November 22
Thanksgiving Holiday	November 24-25
Registration for Spring Semester	November 1-9
Last Day of Semester	December 20
Degrees Awarded	December 23

### Spring Semester 2012

Registration	January 9
Classes Begin	January 9
Last day to register for Spring Semester	January 16
Martin Luther King's Birthday	January 16
President's Day Holiday	February 20
Last day to drop a class	April 20
Registration for Summer Session	April 23- May 2
Last Day of Semester	May 18
Commencement	May 19

### Summer Session 2012

Registration and Begin Classes	May 25
Last day to register for Summer Session	June 4
Independence Day	July 4
Last day to drop a class	June 29
Summer Session Ends	July 20
Degrees Awarded	August 10

### STUDENT HOLIDAYS

Labor Day (First Monday in September)	*Veteran's Day (Nov. 11)
Thanksgiving and following Friday	*Christmas Vacation
New Year's Day	President's Day (3rd Monday in February)
*Memorial Day (last Monday in May)	*Independence Day
Martin Luther King's birthday (3rd Monday in January)	

\*When these holidays fall on Saturday, the preceding Friday is observed as the holiday. When the holiday falls on Sunday, the following Monday is observed. When Christmas Eve falls on Sunday, the preceding Friday is observed. When Christmas Day falls on Saturday, the following Monday is observed. In addition to the above, unscheduled holidays as declared by the governor of Arkansas are observed.

## ACADEMIC CALENDAR FOR GRADUATE SCHOOL

2012-2013

### Fall Semester 2012

Registration	August 15
Orientation	August 15
Classes Begin	August 20
Last day to register for Fall Semester	August 22
Labor Day Holiday	September 3
Veterans Day Holiday	November 12
Last day to drop a class	November 21
Thanksgiving Holiday	November 22
Registration for Spring Semester	November 7-16
Last Day of Semester	December 21
Degrees Awarded	December 22

### Spring Semester 2013

Registration	January 7
Classes Begin	January 7
Last day to register for Spring Semester	January 14
Martin Luther King's Birthday	January 21
President's Day Holiday	February 18
Last day to drop a class	April 19
Registration for Summer Session	April 17- 26
Last Day of Semester	May 17
Commencement	May 18

### Summer Session 2013

Registration and Begin Classes	May 23
Last day to register for Summer Session	June 3
Independence Day	July 4
Last day to drop a class	July 5
Summer Session Ends	July 19
Degrees Awarded	August 9

### STUDENT HOLIDAYS

Labor Day (First Monday in September)	*Veteran's Day (Nov. 12)
Thanksgiving and following Friday	*Christmas Vacation
New Year's Day	President's Day (3rd Monday in February)
*Memorial Day (last Monday in May)	*Independence Day
Martin Luther King's birthday (3rd Monday in January)	

\*When these holidays fall on Saturday, the preceding Friday is observed as the holiday. When the holiday falls on Sunday, the following Monday is observed. When Christmas Eve falls on Sunday, the preceding Friday is observed. When Christmas Day falls on Saturday, the following Monday is observed. In addition to the above, unscheduled holidays as declared by the governor of Arkansas are observed.

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Cover: The bacterial agent of human Q fever, *Coxiella burnetii*, requires a large very unique lysosome-like vacuole within eukaryotic cells to replicate prior to the development of disease. The cover image is a photomicrograph that reveals the bacteria, *C. burnetii*, labeled in red, undergoing replication inside these specialized vacuoles labeled green. The blue label reveals cellular DNA.

Hussain S. Kauser, Broederdorf Laura J.<sup>1</sup>, Sharma Uma M., and Voth Daniel E.<sup>2</sup> (2010) Host kinase activity is required for *Coxiella burnetii* parasitophorous vacuole formation. *Front. Microbio.* 1:137. doi: 10.3389/fmicb.2010.00137.

<sup>1,2</sup> LJB is a UAMS Graduate School PhD candidate in the Microbiology and Immunology Graduate Program. DEV is her major graduate advisor, member of the UAMS Graduate School Faculty, and Assistant Professor in the UAMS College of Medicine Department of Microbiology and Immunology.

## **INTRODUCTION**

The University of Arkansas is committed to the policy of providing educational opportunities to all qualified students regardless of their economic or social status, and will not discriminate on the basis of disability, race, color, sex, creed, veteran's status, age, marital or parental status, or national origin. The Office of Human Relations acts on a campus-wide basis for all students, faculty, and employees regarding such matters, and within each college or school there is an associate or assistant dean designated to assist students of that college in utilizing a special grievance procedure.

Any student who alleges the existence of any policy, procedure, or practice prohibited by Title VI of the Civil Rights Act of 1964 (Title VI), Title IX of the Education Amendments of 1972 (Title IX), the Age Discrimination Act of 1975, Section 504 of the Rehabilitation Act of 1973 (Section 504), and Title II of the Americans with Disabilities Act of 1990 (Title II), and their implementing regulations should contact Dr. Robert McGehee, Dean, 501-686-5454. Copies of the procedure for addressing such grievances are available from the Graduate School Office and in the Graduate School Student Handbook.

This catalog presents specific information about the Graduate School at the University of Arkansas for Medical Sciences, including admission requirements, registration fees, curricula offered, degrees granted, and courses available.

The courses listed in this catalog have been authorized in accordance with policies approved by the academic colleges and the Graduate Council. Schedules of classes for each semester must be consulted to identify the courses that will be offered during a given semester, since the frequency of offering of each course is determined by the department as program needs dictate, with no assurance that a given course will be offered every year. The summaries of courses and prerequisites, when stated, are meant to serve as a guide to degree program planning and are subject to specific determination and consultation with program advisers.

The University of Arkansas for Medical Sciences publishes similar catalogs for its other colleges — the Colleges of Nursing, Health Related Professions, Public Health, Pharmacy, and Medicine. Copies of the catalogs for other colleges at the UAMS as well as information concerning academic programs, fees, financial aid, or housing may be obtained by writing or calling the Dean's office of the various colleges.

## **THE UNIVERSITY**

The University of Arkansas, organized under provisions of the Federal Land-Grant Act, was instituted by the General Assembly of Arkansas, March 27, 1871. Fayetteville was chosen as the site, and first students were enrolled January 22, 1872. The purpose of the Land-Grant Act was to provide a system of public higher education which would offer college opportunities to all qualified persons, regardless of their economic or social status. The University of Arkansas, as a land-grant institution, is committed to this policy. Its basic aim is to provide the finest educational opportunities to all students, regardless of race, color, or creed.

A number of institutions are part of the University of Arkansas System: the University of Arkansas, Fayetteville, the University of Arkansas at Little Rock, the University of Arkansas for Medical Sciences (located in Little Rock), the University of Arkansas at Pine Bluff, the University of Arkansas at Fort Smith, the Division of Agriculture, the Arkansas Archeological Survey, the Criminal Justice Institute and five community colleges.

The University of Arkansas for Medical Sciences includes the Colleges of Medicine, Health Related Professions, Public Health, Pharmacy, Nursing and the Graduate School. It provides a 391-bed teaching hospital, the Barton Research Institute, the Arkansas Cancer Research Center, the Biomedical Research Building, the Jones Eye Institute, the Donald W. Reynolds Center on Aging, Jackson T. Stephens Spine and Neuroscience Institute, and Area Health Education Centers across the state.

The Graduate School was established in 1927. The first graduate classes at the University of Arkansas for Medical Sciences were offered in 1943.

The University of Arkansas for Medical Sciences is accredited by the Higher Learning Commission, a Commission of the North Central Association of College and Schools. The address and telephone number of the Commission are as follows: 30 North LaSalle Street, Suite 2400, Chicago, Illinois 60602-2504, 1-800-621-7440.

### **CHANGES IN CATALOG INFORMATION**

This catalog contains information which should be accurate at the time of completion. However, regulations, fees, programs of study, and individual courses are regularly revised, and the catalog information is thus subject to change.

Students are expected to keep themselves informed concerning current regulations, policies, and program requirements in their fields of study and must meet all requirements of the degree programs in which they are enrolled. Courses which are modified or added to a curriculum and which are incorporated into the curriculum at a level beyond that at which a student is enrolled may become graduation requirements for that student. Courses which are incorporated into the curriculum at a level lower than the one at which the student is enrolled are not required for that student.

### **GRADUATE SCHOOL STUDENT HANDBOOK**

The Graduate School at the University of Arkansas for Medical Sciences publishes a Student Handbook. This publication, which is updated annually, contains information on campus rules and regulations, various campus services, and academic policies. Copies of this Handbook are available at the Graduate School Office and for viewing on the website at [www.uams.edu](http://www.uams.edu). The Student Handbook is provided as a guide, and all Graduate Students are responsible for the information contained in the Student Handbook and the Catalog. As with the catalog, information in the Student Handbook is subject to change.

The Graduate School operates under applicable University of Arkansas Board of Trustees policies and UAMS policies. The policies and procedures in the Catalog and Student Handbook in no way supersede or negate Board of Trustees policies, University-wide memoranda, or UAMS campus policies, but supplement such policies.

### **GRADUATE SCHOOL WEBSITE**

The UAMS Graduate School website is accessed through the UAMS homepage at [www.uams.edu](http://www.uams.edu). It is located under the heading of "Education" on the UAMS homepage, and under the heading labeled "For Students". There is also a copy of the Catalog, the Student Handbook, the latest academic calendar, and other items of interest to students on the website.

All UAMS graduate students are urged to periodically review current student information on the website.

### **CATALOGS OF OTHER UAMS COLLEGES**

The catalogs of other UAMS colleges may publish information about the Graduate Programs relating to other programs of study directed by their faculty. This is provided as an information service only, and in no way replaces or supersedes the UAMS Graduate School Catalog.

# UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES

## Vision, Mission and Core Values

### Vision

UAMS is a world-renowned academic health sciences center improving the health of Arkansans.

### Mission

To teach, to heal, to search, to serve.

### Mission Statement

The mission of UAMS is to improve the health, healthcare and well-being of all Arkansans and of others in the region, nation and the world through the following:

- Education of exemplary health care providers
- Provision of standard-setting, comprehensive clinical programs
- Scientific discovery and research
- Extension of services to the State of Arkansas and beyond

### Core Values

**Integrity** – We foster, encourage and expect honesty and the highest ethical standards in all that we do.

**Respect** – We embrace a culture of professionalism with respect for the dignity of all persons, honoring the unique contributions provided by a diversity of perspectives and cultures.

**Teamwork** – We seek to create interdisciplinary, synergistic and collegial relationships characterized by collaboration, inclusiveness and flexibility.

**Creativity** – We encourage and support innovation, imagination, ingenuity, resourcefulness and vision.

**Excellence** – We strive to achieve, through continuous improvement and adherence to institutional policies and best practices, the highest quality and standards in all our endeavors.

The University of Arkansas for Medical Sciences (UAMS) is Arkansas' only institution of professional and graduate education devoted solely to the health and biological sciences. First founded as a School of Medicine June 17, 1879, UAMS became a medical sciences campus in 1951 with the addition of the College of Pharmacy. The College of Nursing was established in 1953, and the new University Hospital was built in 1956. The College of Health Related Professions was organized as a separate college within UAMS in 1971. The Graduate Program was organized as an extension of the Graduate School of the University of Arkansas at Fayetteville in 1943, and was approved for independent status by the Board of Trustees in 1995. The Area Health Education Centers Program (AHEC) was established in 1973. The Arkansas Cancer Research Center (ACRC) now the Winthrop P. Rockefeller Cancer Research Institute, was established in 1984. The Myeloma Institute for Research and Therapy was established in 1989. The Harvey and Bernice Jones Eye Institute (HBJEI) was established in 1993. The Donald W. Reynolds Institute on Aging was established in 1996. The Stephens Spine Center was established in 2003. The Psychiatric Research Institute was established in 2008. Today, UAMS is one of eight campuses of the University of Arkansas. It has grown into an academic health sciences center that encompasses broad aspects of education, research, and service. The institution offers programs that improve the physical, economic, and intellectual well-being of the citizens of Arkansas.

In fulfilling its educational mission, the six academic units of the UAMS, the University Hospital, the Area Health Education Centers, and the six institutes provide the environment and opportunities for students and practitioners alike to learn and maintain the knowledge and skills they need. These programs integrate the liberal arts with the biological, physical, and behavioral sciences, and emphasize life-long learning for practitioners in the health professions.

UAMS is the principal biomedical research center for the state of Arkansas. In its programs of research, UAMS seeks to stimulate and support scholarly inquiry for both faculty and students aimed at maintaining and preserving knowledge, and making discoveries that address the health needs of the state, nation, and world.

These research programs enhance the economic and educational progress of Arkansas through technology transfer and collaborative arrangements with other qualified individuals, groups, companies and institutions. The research mission involves the quest for new information, the organization of known information in new ways, and the sharing of this information with the scientific community.

The service mission is fulfilled by providing comprehensive health care services to meet both the educational needs of our students and the health care needs of the state. As the only academic medical center in Arkansas, the unique role of UAMS is providing services requiring highly specialized personnel and technology. These services are delivered in an interdisciplinary environment to all Arkansans regardless of their ability to pay.

In addition, comprehensive services in health, wellness, and rehabilitation are offered in a statewide context. Our service mission is enhanced by affiliations with Arkansas Children's Hospital, the John L. McClellan Memorial Veterans Administration Medical Center, the Arkansas Rehabilitation Institute, the Central Arkansas Radiation Therapy Institute, and the Arkansas State Hospital. Additional cooperative programs are offered with other hospitals and practitioners affiliated with the AHEC Programs. UAMS has a responsibility to provide health care services in a manner that ensures the long-range financial viability and continued quality of its programs, while providing the most cost-effective care for its patients.

The UAMS mission encompasses a responsibility to its alumni and other health care practitioners of Arkansas to help them continue to improve their professional knowledge and skills. All schools and departments offer life-long learning opportunities as appropriate to their missions. The University Library also serves as a resource for all health professionals by maintaining a portfolio of information services needed to support their information needs.

UAMS values its role of service to the general welfare of the state of Arkansas. This service includes action as a partner in science and health areas to all levels of the educational systems of the state. As the leader in health care, the institution provides educational programs, consultation, and technical advice to other institutions, agencies, and local communities for the purpose of improving and maintaining the health of citizens.

The role of UAMS in the economic life of the community is significant. A major element of the central Arkansas economy, the salaries of a highly trained work force contribute substantially to the regional economy.

UAMS fulfills its mission through coordinated action of the following units:

- College of Medicine
- College of Pharmacy
- College of Nursing
- College of Public Health
- College of Health Related Professions
- Graduate School
- Area Health Education Centers
- Winthrop P. Rockefeller Cancer Institute
- Donald W. Reynolds Institute on Aging
- Harvey and Bernice Jones Eye Institute
- Myeloma Institute for Research and Therapy
- Psychiatric Research Institute
- Jackson T. Stephens Spine and Neurosciences Institute
- University Hospital of Arkansas.

## **THE MISSION STATEMENT OF THE GRADUATE SCHOOL**

The mission of the University of Arkansas for Medical Sciences Graduate School is to provide excellent educational opportunities for students of the health care professions in a stimulating environment of basic and clinical research, integrated with the delivery of superb comprehensive health care services.

The specific mission of the graduate school is

- to educate researchers, educators and advanced professionals in the health sciences;
- to develop new knowledge and techniques fundamental to advances in health services, biomedical technology, and understanding of people in the context of health and illness;
- to provide initial and continuing educational opportunities for health science faculties at all institutions in the state;
- to provide a gateway for health science professionals and teachers in the state into the universe of knowledge relevant to their practices at the most advanced level and highest standard of excellence.

All this to be in an atmosphere characterized by relations of mutual respect, integrity, and good will.

# UNIVERSITY OF ARKANSAS

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**UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES  
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## **THE GRADUATE SCHOOL OFFICE**

The Graduate School Office is located in the Administration West Building, south of the UAMS Bookstore on the University of Arkansas for Medical Sciences campus. The office is open Monday through Friday from 8:00 a.m. to 4:30 p.m. central standard time.

The mailing address is:           UAMS Graduate School Office  
  4301 West Markham, #601  
  Little Rock, AR 72205

The telephone number is:       501-686-5454

The FAX number is:             501-686-5661

The web site address is:        [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

## **The UAMS Graduate Council As of the Date of Catalog Publication**

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University), Adjunct Faculty, Pharmaceutical  
Sciences

**Das, Kumuda C., Ph.D.**, (Virginia-Maryland College of Veterinary Medicine), Associate Professor, Interdisciplinary Biomedical Sciences and Pathology

**Davidson, Mari, Ph.D.**, (University of Illinois at Chicago Medical Center), Associate Professor, Biochemistry and Molecular Biology

**Davies, David L., Ph.D.**, (Louisiana State University), Associate Professor, Neurobiology and Developmental Sciences

**Dawson, Amanda Wells, M.S.** (University of Arkansas for Medical Sciences), Instructor, Clinical Nutrition

**Delclos, Kenneth B., Ph.D.**, (Harvard University), Adjunct Assistant Professor, Interdisciplinary Toxicology

**DeLuca, Donald C., Ph.D.**, (University of Minnesota), Associate Professor Emeritus, Biochemistry and Molecular Biology

**Deutz, Nicolaas, M.D., Ph.D.** (University of Amsterdam), Professor, Clinical Nutrition

**Diekman, Alan B., Ph.D.**, (Northwestern University), Associate Professor, Biochemistry and Molecular Biology

**Dienel, Gerald A., Ph.D.**, (Harvard University), Professor, Cellular Physiology and Molecular Biophysics

**Dobretsova, Maxim, Ph.D.** (Sankt-Petersburg State University), Associate Professor, Neurobiology and Developmental Sciences

**Dornhoffer, John, M.D.**, (University of Kansas School of Medicine), Professor, Neurobiology and Developmental Sciences

**Douglas, Michael, Ph.D.**, (St. Louis University), Professor, Biochemistry and Molecular Biology

**Drew, Paul D., Ph.D.** , (University of Maryland), Professor, Neurobiology and Developmental Sciences, and Interdisciplinary Biomedical Sciences

**Eaton, Beth B., M.A.**, (Texas Woman's University), Instructor, Communicative Disorders

**Edmondson, Ricky, Ph.D.**, (Texas A & M University) Associate Professor, Medicine

**Eigenbrodt, Marsha, M.D.** (Louisiana State University School of Medicine), Assistant Professor, Interdisciplinary Biomedical Sciences

**Eisenach, Kathleen, Ph.D.**, (University of Arkansas for Medical Sciences), Professor, Pathology, and Associate Professor, Microbiology and Immunology

**Eoff, Robert L., Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Biochemistry and Molecular Biology

**Epstein, Joshua, D.Sc.**, (Technion), Professor, Interdisciplinary Biomedical Sciences and Bioinformatics

**Eswaran, Hari, Ph.D.**, Ph.D., (University of Arkansas at Little Rock), Assistant Professor, Bioinformatics

**Fan, Chun-Yang, Ph.D.**, (Manchester University), Associate Professor, Pathology

**Fan, Kang, M.D., Ph.D.**, (University of California), Associate Professor, Pathology

**Fantegrossi, William E., Ph.D.**, (University of Michigan), Assistant Professor, Pharmacology and Interdisciplinary Toxicology

**Ferguson, Alesia C., Ph.D.** (Stanford University), Assistant Professor, Occupational and Environmental Health

**Ferguson, Sherry A., Ph.D.** (University of Wisconsin-Madison), Adjunct Associate Professor, Interdisciplinary Biomedical Sciences

**Fifer, E. Kim, Ph.D.**, (University of Mississippi), Professor, Pharmaceutical Sciences, and Assistant Professor, Interdisciplinary Toxicology

**Forrest, James Craig, Ph.D.**, (Vanderbilt University), Assistant Professor, Microbiology and Immunology

**Fu, Peter P.-C., Ph.D.**, (University of Illinois at Chicago), Adjunct Professor, Interdisciplinary Toxicology

**Gaddy, Dana, Ph.D.**, (Baylor University) Associate Professor, Cellular Physiology and Molecular Biophysics

**Gandy, Jay, Ph.D.**, (University of California-Riverside), Professor, Interdisciplinary Toxicology, Pharmacology, and Occupational and Environmental Health

**Garcia-Rill, Edgar, Ph.D.**, (McGill University), Professor, Neurobiology and Developmental Sciences

**Gentry, Betholyn, Ph.D.**, (Memphis State University), Professor, Communication Sciences and Disorders

**Gentry, W. Brooks, M.D.**, (University of Arkansas), Professor, Pharmacology

**Gilbert, Kathleen, Ph.D.**, (Tulane University), Associate Professor, Microbiology and Immunology

**Gonzales, Dana B., Ph.D.**, (University of Arkansas), Instructor, Clinical Nutrition

**Goodwin, Julia A., Ph.D.**, (University of Arkansas for Medical Sciences), Clinical Assistant Professor, College of Nursing

**Gottschall, Paul E., Ph.D.**, (Michigan State University), Professor, Pharmacology and Interdisciplinary Toxicology

**Gray, Shirley, M.A.**, (University of Arkansas at Little Rock), Adjunct Faculty, Pharmaceutical Sciences

**Gray, Wayne L., Ph.D.**, (University of South Alabama), Professor, Microbiology and Immunology and Bioinformatics

**Green, Angela, Ph.D.**, (University of Arkansas for Medical Sciences), Clinical Associate Professor, Nursing Science

**Greene, Paul, Ph.D.**, (University of Georgia), Professor, Health Promotion and Prevention Research

**Griffin, W. Sue T., Ph.D.**, (University of Rochester), Adjunct Professor, Neurobiology and Developmental Sciences, and Cellular Physiology and Molecular Biophysics

**Gubbins, Paul, PharmD**, (University of Illinois at Chicago) Professor, Pharmaceutical Sciences

**Gullette, Donna, DSN, RN**, (University of Alabama), Clinical Associate Professor, Nursing Science

**Gurley, Bill J., Ph.D.**, (University of Tennessee at Memphis), Professor, Pharmaceutical Sciences

**Guyette, Thomas, Ph.D.**, (University of Kansas), Professor and Chair, Communicative Disorders

**Haas, Bruce, M.S.**, (Sarah Lawrence College), Program Director, Assistant Professor, Genetic Counseling

**Hakkak, Reza, Ph.D.**, (University of Arkansas at Fayetteville), Professor and Chair, Clinical Nutrition

**Halverson, Paul, Dr.P.H.**, (University of North Carolina at Chapel Hill), Professor, Health Systems Research

**Hansen, Deborah K., Ph.D.**, (Indiana University), Adjunct Assistant Professor, Interdisciplinary Toxicology

**Harik, Sami, M.D.**, (American University of Beirut, School of Medicine), Professor, Pharmacology

**Hartwig, Mary S., Ph.D.**, (University of Tennessee at Memphis), Associate Professor, Nursing Science

**Hauer-Jensen, Martin, M.D., Ph.D.**, (University of Oslo), Adjunct Professor, Professor, Pathology, Professor, Interdisciplinary Biomedical Sciences

**Haun, Randy S., Ph.D.**, (Purdue University), Associate Professor, Pathology

**Hayar, Abdallah, Ph.D.**, (University Louis Pasteur), Associate Professor, Neurobiology and Developmental Sciences

**Heflich, Robert, Ph.D.**, (Rutgers- The State University of New Jersey), Adjunct Associate Professor, Interdisciplinary Toxicology

**Helm, Mark, M.D.**, (Mercer University School of Medicine), Assistant Professor, Pharmaceutical Sciences

**Hendrickson, Howard, Ph.D.** (University of Arkansas, Fayetteville), Professor, Pharmaceutical Sciences

**Hennings, Leah, DVM** (University of Tennessee, College of Veterinary Medicine), Research Assistant Professor, Pathology

**Heo, Seongkum, Ph.D.** (University of Kentucky), Assistant Professor, Nursing Science

**Herman, Damir, Ph.D.** (Case Western Reserve University), Assistant Professor, Bioinformatics

**Hiatt, Kim, M.D.**, (Georgetown University School of Medicine), Associate Professor, Pathology

**Highley, Patricia A., M.S.**, (University of Arkansas for Medical Sciences), Instructor, Communicative Disorders

**Higuchi, Marashiro, Ph.D.**, (University of Tokoyo), Assistant Professor, Biochemistry and Molecular Biology

**Hilliard, Nicki L., Pharm.D.**, (University of Arkansas College of Pharmacy), Associate Professor, Pharmaceutical Sciences

**Hinson, Jack A., Ph.D.**, (Vanderbilt University), Professor, Interdisciplinary Toxicology, Pharmacology, and Environmental and Occupational Health

**Hobbs, Charlotte, A., Ph.D.**, (McGill University, Montreal, Quebec), **M.D.**, (McMaster University, Ontario) Professor, Interdisciplinary Biomedical Sciences

**Hogan, William, M.D.**, (Jefferson Medical College), Associate Professor, Bioinformatics

**Holmes, Talmage, Ph.D.**, (University of Texas School of Public Health), Assistant Professor, Occupational and Environmental Health

**Hough, Aubrey, M.D.** (Vanderbilt University), Professor, Pathology

**Howard, Paul, Ph.D.**, (University of Arkansas for Medical Sciences), Adjunct Associate Professor, Interdisciplinary Toxicology

**Hudson, Teresa, PharmD**, (St. Louis College of Pharmacy), Research Assistant Professor, Pharmaceutical Sciences

**Hutton, Terri J., M.F.A.**, (Southern Methodist University), Assistant Professor, Communicative Disorders

**James, George Andrew, Ph.D.**, (University of Florida), Assistant Professor, Interdisciplinary Biomedical Sciences

**James, Laura, M.D.**, (University of Arkansas for Medical Sciences), Professor, Interdisciplinary Toxicology

**James, S. Jill, Ph.D.**, (University of California, Los Angeles), Assistant Professor, Interdisciplinary Toxicology

**Jennings, Michael L., Ph.D.**, (Harvard University), Professor and Chair, Cellular Physiology and Molecular Biophysics

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**Jilka, Robert, Ph.D.** (St. Louis University) Professor, Interdisciplinary Biomedical Sciences

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**Kelly, Thomas J., Jr., Ph.D.**, (University of North Carolina at Chapel Hill), Associate Professor, Pathology

**Kennedy, Robert, Ph.D.**, (University of Missouri), Clinical Associate Professor, Nursing Science

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**Kim, Cherng-ju, Ph.D.**, (McMaster University), Associate Professor, Pharmaceutical Sciences

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**Landes, Reid, Ph.D.**, (Iowa State University), Assistant Professor, Biostatistics

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**Lawson, Louanne, Ph.D.**, (University of Texas at Austin), Associate Professor, Nursing Science

**Lee, Chia Y., Ph. D.**, (Kansas State University), Professor, Microbiology and Immunology

**Lee, Jeannett Y., Ph.D.**, (Johns Hopkins University), Professor, Biostatistics

**Lefler, Leanne, Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Nursing Science

**Li, Chenghui, Ph.D.**, (Indiana University), Assistant Professor, Pharmaceutical Sciences

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**Liu, S. Jessie, Ph.D.**, (Duke University Medical Center), Associate Professor, Pharmaceutical Sciences and Assistant Professor, Pharmacology

**Lopez-Becerra, R. Lilia, Ph.D.**, (University of Illinois), Associate Professor, Pharmaceutical Sciences, and Assistant Professor, Interdisciplinary Toxicology

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**MacLeod, Stewart, Ph.D.**, (University of Arkansas for Medical Sciences), Research Assistant Professor, Interdisciplinary Biomedical Sciences

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**Marsh, James D., M.D.**, (Harvard Medical School), Professor, Pharmacology

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**Mays, Glen, Ph.D.**, (University of North Carolina at Chapel Hill), Professor, Health Systems Research

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**Megyesi, Judit, M.D.**, (Semmelweis University of Medicine, Hungary), Adjunct Research Associate Professor, Cellular Physiology and Molecular Biophysics

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**Middaugh, Donna, Ph.D.**, (Kennedy Western University), Associate Professor, Nursing Science

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**Millner, Glenn C., Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Occupational and Environmental Health

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**Moran, Jeffery, Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Occupational and Environmental Health

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**Nowak, Grazyna, Ph.D.**, (Jagiellonian University in Poland), Associate Professor, Pharmaceutical Sciences

**Nye, Alan C., Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Occupational and Environmental Health

**O'Brien, Charles, Ph.D.**, (University of Oklahoma Health Science Center), Research Professor, Interdisciplinary Biomedical Sciences

**Oliveto, Alison, Ph.D.**, (University of North Carolina at Chapel Hill), Professor, Interdisciplinary Biomedical Sciences

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**Paniagua, Carmen, Ed.D.**, (University of Arkansas at Little Rock), Clinical Assistant Professor, Nursing Science

**Patterson, Tucker, Ph.D.**, (University of South Carolina), Adjunct Assistant Professor, Interdisciplinary Toxicology and Bioinformatics

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**Payakachat, Nalin, Ph.D.** (Purdue University), Assistant Professor, Pharmaceutical Evaluation and Policy

**Peterson, Eric Charles, Ph.D.**, (University of Arkansas), Assistant Professor, Pharmacology

**Phelan, Kevin D., Ph.D.**, (Michigan State University), Associate Professor, Neurobiology and Developmental Sciences

**Pierce, Dwight, Ph.D.**, (University of Iowa), Associate Professor, Pharmaceutical Sciences

**Ponnappan, Usha, Ph.D.**, (Bombay University), Professor, Microbiology and Immunology

**Post, Steven R., Ph.D.**, (University of Chicago), Professor, Pathology and Interdisciplinary Biomedical Sciences

**Prather, Paul L., Ph.D.**, (University of Georgia), Associate Professor, Pharmacology and Interdisciplinary Toxicology

**Preissl, Hubert, Ph.D.**, (University of Tübingen), Research Associate Professor, Bioinformatics

**Prewitt, Theresa E., Dr. P.H.**, (University of North Carolina-Chapel Hill), Associate Professor, Health Systems Research

**Price, Peter, Ph.D.**, (University of Uppsala, Sweden), Adjunct Professor, Cellular Physiology and Molecular Biophysics

**Pulley, LeaVonne, Ph.D.**, (University of Texas-Austin), Associate Professor, Health Promotion and Prevention Research

**Raczynski, James, Ph.D.**, (Pennsylvania State University), Professor, Health Promotion and Prevention Research

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**Rhee, Sung W., Ph.D.** (University of Washington), Assistant Professor, Pharmacology and Interdisciplinary Toxicology

**Richter, Jan, Ed.D.**, (Oklahoma State University), Assistant Professor, Health Promotion and Prevention Research

**Rimmer, Thomas W., ScD., C.I.H.**, (University of Massachusetts at Lowell), Assistant Professor, Occupational and Environmental Health

**Roberson, Paula K., Ph.D.** (University of Washington), Professor and Chair, Biostatistics and Bioinformatics

**Robinson, Gregory, Ph.D.** (Michigan State University), Assistant Professor, Communicative Disorders

**Rodibaugh, Rosemary, Ph.D.**, (Purdue University), Adjunct Assistant Professor, Clinical Nutrition

**Ronis, Martin J. J., Ph.D.**, (University of Reading), Professor, Interdisciplinary Toxicology and Pharmacology

**Rusch, Nancy J., Ph.D.**, (Mayo Clinic), Professor, Pharmacology and Interdisciplinary Toxicology

**Ryan, Kevin, J.D.**, (University of Arkansas at Little Rock), Associate Professor, Health Promotion and Prevention Research

**Safirstein, Robert, M.D.**, (University of Cincinnati), Adjunct Professor, Cellular Physiology and Molecular Biophysics and Bioinformatics

**Said, Qayyim, Ph.D.**, (University of Utah, Salt Lake City), Assistant Professor, Pharmaceutical Sciences

**Sanger, Warren, Ph.D.**, (University of Nebraska, Lincoln), Adjunct Professor, Genetic Counseling

**Sawyer, Jeffrey R., Ph.D.**, (Florida Institute of Technology), Professor, Pathology

**Schaefer, G. Bradley, M.D.** (University of Oklahoma Health Sciences Center), Professor, Genetic Counseling

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**Shafirstein, Gal, Ph.D.** (Technion, Israel Institute of Technology), Assistant Professor, Interdisciplinary Biomedical Sciences

**Shah, Sudhir V., M.D.**, (Bombay University), Professor, Interdisciplinary Biomedical Sciences

**Shankar, Kartik, Ph.D.**, (University of Louisiana, Monroe), Assistant Professor, Interdisciplinary Biomedical Sciences

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**Simmen, Frank, Ph.D.**, (University of Hawaii), Professor, Cellular Physiology and Molecular Biophysics and Bioinformatics

**Simmen, Rosalia, Ph.D.**, (University of Hawaii), Professor, Cellular Physiology and Molecular Biophysics

**Simmons, Henry F., M.D., Ph.D.**, (University of Arkansas for Medical Sciences), Associate Professor, Interdisciplinary Toxicology

**Skinner, Robert D., Ph.D.**, (University of Texas), Professor, Neurobiology and Developmental Sciences

**Slikker, William Jr., Ph.D.**, (University of California), Adjunct Professor, Interdisciplinary Toxicology, Pharmacology and Bioinformatics

**Smeltzer, Mark S., Ph.D.**, (Kansas State University), Professor, Microbiology and Immunology and Bioinformatics

**Smith-Olinde, Laura, Ph.D.**, (Louisiana State University), Assistant Professor, Communicative Disorders

**Smoller, Bruce R., M.D.**, (University of Cincinnati), Professor and Interim Chairman, Pathology

**Soderberg, Lee S.F., Ph.D.**, (Rutgers-The State University of New Jersey), Professor, Microbiology and Immunology

**Souder, Elaine, Ph.D.**, (Boston College), Professor, Nursing Science

**Soulsby, Michael E., Ph.D.**, (West Virginia University), Associate Professor, Cellular Physiology and Molecular Biophysics, Interdisciplinary Toxicology and Bioinformatics

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**Stanger, Catherine, Ph.D.**, (Rutgers University), Associate Professor, Interdisciplinary Biomedical Sciences

**Stewart, Katherine E., Ph.D.**, (University of Alabama at Birmingham), Associate Professor and Associate Dean, Health Promotion and Prevention Research

**Stewart, Mary K., M.D.**, (University of Arkansas for Medical Sciences), Associate Professor, Health Systems Research

**Stimers, Joseph R., Ph.D.**, (University of Southern California), Professor, Pharmacology and Interdisciplinary Toxicology

**Storrie, Brian, Ph.D.**, (California Institute of Technology), Professor, Cellular Physiology and Molecular Biophysics

**Suen, James Y., M.D.**, (University of Texas), Otorhinolaryngology Professor, Audiology and Speech Pathology

**Suva, Larry, Ph.D.**, (University of Melbourne, Australia), Professor, Cellular Physiology and Molecular Biophysics and Bioinformatics

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**Tackett, Alan, Ph.D.**, (University of Arkansas for Medical Sciences), Assistant Professor, Biochemistry and Molecular Biology

**Tak, Sunghee, Ph.D.**, (University of Texas at Austin), Associate Professor, Nursing Science

**Tank, Patrick W., Ph.D.**, (University of Michigan), Professor, Neurobiology and Developmental Sciences

**Telemaque, Sabine, Ph.D.**, (University of Sherbrooke, Quebec, Canada), Assistant Professor, Interdisciplinary Biomedical Sciences

**Theus, Sue, Ph.D.**, (University of Arkansas for Medical Sciences), Research Assistant Professor, Pathology

**Tilford, John M., Ph.D.**, (Wayne State University), Associate Professor, Biostatistics

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**Wayne, John, Ph.D.**, (University of Alabama at Birmingham), Professor, Health Systems Research

**Weatherton, Maurice A., Ph.D.**, (University of Kansas), Professor Emeritus, Communicative Disorders

**Weddington, Gail Lynn, Au.D.**, (University of Florida), Instructor, Communicative Disorders

**Wei, Jeanne, Ph.D.**, (University of Illinois), Professor, Interdisciplinary Biomedical Sciences

**Wenger, Galen R., Ph.D.**, (West Virginia University), Professor, Pharmacology, Interdisciplinary Toxicology

**Wessinger, William D., Ph.D.**, (Virginia Commonwealth University), Associate Professor, Interdisciplinary Biomedical Sciences, Pharmacology and Interdisciplinary Toxicology

**West, Donna Sue, Ph.D.**, (University of Mississippi), Assistant Professor, Pharmaceutical Sciences

**West, Delia Smith, Ph.D.**, (Rutgers University), Professor, Health Promotion and Prevention Research

**Wight, Patricia A., Ph.D.**, (University of California - Riverside), Professor, Cellular Physiology and Molecular Biophysics and Bioinformatics

**Williams, David Keith, Ph.D.**, (University of Oklahoma Health Sciences Center), Associate Professor, Biostatistics

**Williamson, Lori, M.S.** (University of Michigan), Adjunct Assistant Professor, Genetic Counseling

**Winston, Michael E., Ph.D.**, (University of Kansas), Adjunct Assistant Professor, Communicative Disorders

**Wolfe, Jonathan J., Ph.D.**, (University of Virginia), Associate Professor, Pharmaceutical Sciences

**Yaccoby, Shmuel, Ph.D.**, (The Hebrew University of Jerusalem), Adjunct Assistant Professor, Cellular Physiology and Molecular Biophysics

**Yang, Liu, Ph.D.**, (Indiana University School of Medicine), Associate Professor, Pathology

**Young, John F., Ph.D.**, (University of Florida), Adjunct Assistant Professor, Interdisciplinary Toxicology, and Adjunct Faculty, Pharmaceutical Sciences

**Young, Kevin D., Ph.D.**, (University of Oklahoma), Professor, Microbiology and Immunology

**Zhang, Xiaomin, Ph.D.**, (University of Montpellier), Assistant Professor, Neurobiology and Developmental Sciences

**Zhang, Xuming, D.V.M., Ph.D.**, (Justus Liebig University of Giessen), Professor, Microbiology and Immunology

**Zheng, Fang, Ph.D.**, (University of Texas Medical Branch), Associate Professor, Pharmacology and Interdisciplinary Toxicology

**Zimniak, Piotr, Ph.D.**, (University of Vienna), Professor, Interdisciplinary Toxicology, Biochemistry and Molecular Biology, and Pharmacology

**Zraick, Richard I., Ph.D.**, (Arizona State University), Associate Professor, Communicative Disorders

# OBJECTIVES, REGULATIONS, DEGREES

## OBJECTIVES

In addition to the advancement and dissemination of knowledge, the general objective of the Graduate School is to provide an opportunity for the development of the intellectual potential of individuals in an environment of freedom of expression and inquiry and to enhance the academic integrity of the institution.

## ADMISSION

Applicants who have earned a baccalaureate degree from a regionally accredited institution in the United States, or from a foreign institution with similar requirements for the baccalaureate degree, may be considered for admission to the Graduate School.

**Application.** Any individual desiring admission to the Graduate School must submit a fully completed application form to the Graduate School Office. An online application may be obtained on the UAMS Graduate School website at <http://www.uams.edu/gradschool/>

Completed paper application forms should be submitted to:  
UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES  
GRADUATE SCHOOL OFFICE  
4301 West Markham, Slot 601  
Little Rock, AR 72205

### Requirements for Admission.

1. A minimum cumulative grade-point average of 2.70 (A=4.00) or better on all undergraduate coursework attempted at a regionally accredited institution of higher education is required (regardless of any modifications to the academic record by the undergraduate institution on the basis of academic clemency or grade forgiveness policies). UAMS Graduate School does not have a forgiveness policy for evaluation of transcripts. However; should an applicant fail to meet this requirement, the program may petition on behalf of the applicant the Dean of the Graduate School to consider an exception to this requirement. Any decisions by the Dean to grant exceptions will be considered on a case by case basis.
2. A score (or scores) acceptable to the program on the Graduate Record Examination (GRE). Programs have the option to petition on behalf of the applicant the Dean of the Graduate School to substitute other test scores on a case by case basis.
3. Three letters of recommendation from individuals who can speak to the applicant's academic experience.
4. Transcripts. It is the applicant's responsibility to request that one official copy of the applicant's academic record be sent directly to the Graduate School Office from EACH college or university that the applicant has previously attended. The academic record should include all courses, grades, credits attempted, and degree(s) earned. (Note: The fact that courses completed at one institution may be included on a transcript from another institution will not suffice; official transcripts must be received from each institution previously attended.) All transcripts become the property of the University of Arkansas for Medical Sciences Graduate School and will not be released to the applicant or to any other person, institution or agency. No official action is taken on any application until all transcripts are received.

## **Requirements for Admission of International Applicants.**

1. All international applicants, including resident and non-resident aliens, whose native language is not English and who do not have a bachelor's or master's degree from a regionally accredited U.S. institution, are required to achieve a minimum score of 550 on the paper based written Test of English as a Foreign Language (TOEFL). A minimum score of 213 is required on the computer-based version of the examination and a minimum score of 79 is required on the internet-based version of the examination (programs have the option of setting higher score requirements). If your country's native language is English and you are not a United States citizen, the Graduate School requires documentation of English as your native country's language. The test must be taken within the two years immediately preceding the requested semester of admission. An original copy of the test score, sent by the testing agency to UAMS, is required before any action is taken on an application. The copy of the score provided to the student and subsequently forwarded to UAMS is not acceptable. Programs may petition the Dean of the Graduate School, on behalf of the applicant, to consider an exception to this requirement based on the program's interaction with the student. Any decisions by the Dean to grant exceptions will be considered on a case by case basis. The UAMS code for TOEFL is 6901.
2. All international applicants are required to take the Graduate Record Examination (GRE). An official copy of the test score, sent by the testing agency to UAMS, is required before any action is taken on an application. The copy of the score provided to the student is not acceptable. Programs have the option to petition the Dean of the Graduate School on behalf of the applicant to substitute other official test scores on a case by case basis. (Note: No decisions concerning the likelihood of admission will be based solely upon receipt of GRE scores. A completed application packet is mandatory for admission consideration.) The UAMS code for GRE is 6901.
3. All international applicants applying to Master of Science programs must submit an Affidavit of Support stating the current estimated total amount for two years of educational and living expenses. Please refer to the Graduate School website for the required current estimated total amount.
4. International applicants are also required to submit a Student Statement, Summary of Experience, three letters of recommendation, and transcripts from each university attended.

## **Admission Process**

The Graduate School Office facilitates the administrative portion of the admission process; however, admission decisions are made within a specific graduate program. Programs formulate a recommendation for admission for each applicant and then forward the recommendation to the Dean of the Graduate School. The Dean subsequently acts on this recommendation through an official letter to the applicant. Within the framework of the admission requirements stated above, programs may establish their own additional admission requirements and standards. Applicants should carefully review the language concerning admission requirements under the appropriate program headings in the catalog.

## **NON IMMIGRANT STUDENTS**

UAMS is authorized under federal law to enroll nonimmigrant students.

## **NON DEGREE SEEKING STUDENTS**

A student who has not been accepted in a program of study leading to a specific graduate degree may take no more than 12 semester hours of graduate-level courses that can be counted toward the requirements for a graduate degree. At the time of acceptance in a degree program, the chairman of the appropriate department will recommend to the Graduate School which courses previously taken, if any, are to be accepted in the degree program.

Subject to the approval of the Dean of the Graduate School, individuals may be granted permission by the instructor and department to enroll in classes as non-degree seeking students. Formal admission to the Graduate School is not required; however, students in this category are subject to the provisions of this section

Non-degree seeking students are subject to all other regulations, policies, and procedures stated in the Graduate Student Handbook and Graduate School Catalog.

# STUDENT RECORDS POLICY

## Student Inspection of Academic Records

STUDENT RIGHTS UNDER THE FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)  
The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. They are:

1. The right to inspect and review the student's education records within 45 days of the day the University receives a request for access. Students should submit to the registrar, dean, head of the academic department, or other appropriate official, written requests that identify the record(s) they wish to inspect. The University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.
2. The right to request the amendment of the student's education records that the student believes is inaccurate or misleading. Students may ask the University to amend a record that they believe is inaccurate or misleading. They should write the University official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate or misleading. If the University decides not to amend the record as requested by the student, the University will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.
3. The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent the FERPA authorizes disclosure without consent. One exception which permits disclosure without consent is disclosure to school officials with legitimate educational interests. A school official is a person employed by the University in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the University has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks.

A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

Upon requests, the University discloses education records without consent to officials of another school, in which a student seeks or intends to enroll. Note: FERPA requires an institution to make a reasonable attempt to notify the student of the records requests unless the institution states in its annual notification that it intends to forward records on request.

4. The right to file a complaint with the US Department of Education concerning alleged failures by State University to comply with the requirements of FERPA. The name and address of the Office that administers FERPA is:

Family Policy Compliance Office  
US Department of Education  
400 Maryland Avenue, SW  
Washington, DC 20202-4605

5. The right to withhold consent of disclosure of directory information, which information includes: the student's name, address, telephone number, major field of study, classification by year, scholarships, most recent previous educational agency or institution attended, and photograph.

This information will be subject to public disclosure unless the student informs the Registrar in writing before the end of the first week of classes that he or she does not want any or all of this information designated as directory information.

### **Requesting a Transcript**

Contact the Graduate School Office for official transcripts. Transcript request forms are posted on the Graduate School website. Grades and transcripts will be withheld and registration refused to any student who fails to complete a Student Clearance Form, who fails to return laboratory, library or other university property entrusted to their care; who fails to comply with rules governing the audit of student organization accounts; or who has failed to pay any fees, tuition, room charges, fines or other charges assessed by UAMS.

## **STUDENT FINANCIAL SERVICES**

In order to better serve you, the Student Financial Services Department is divided into two divisions: Awards and Disbursements/Billing.

The role of the Awards Division is to actively assist the students in seeking and securing financial resources. Please visit [www.uams.edu/studentfinancialservices](http://www.uams.edu/studentfinancialservices) for information on determining financial aid eligibility and the application process. You may also visit their office located in Admin West Building Room 1.120 (located across from the Bookstore), Monday-Friday 8-4:30, or call 501-686-5451 for more information.

The role of the Disbursement/Billing Division is to coordinate the disbursement of awarded financial aid, process tuition payments and manage UAMS federal and institutional student loan programs. Please visit [www.uams.edu/studentfinancialservices](http://www.uams.edu/studentfinancialservices) for information on paying your tuition or receiving your financial aid refund check. You may also visit their office located in the Admin West Building Room 1.106 (located across from the Bookstore), Monday-Friday 8-4:30, or call 501-686-6128 for more information.

## **Student Residence Status for Tuition and Fee Purposes**

### **DETERMINATION OF RESIDENCY STATUS**

Students are classified as “resident” or “non-resident” students for fee purposes on the basis of their legal domicile or that of their parents if they are minors. In general, a student must be a bona fide resident of Arkansas for at least 6 consecutive months prior to registration to be classified as an “in-state” student.

Complete regulations and forms for requesting a change in classification for this purpose may be obtained from the Vice Chancellor for Academic Affairs and Research Administration, who determines residency matters arising on this campus. All pertinent factors indicative of a student’s state of mind regarding domicile will be considered in determining residency.

### **RESIDENCY STATUS OF NATIVE AMERICANS**

Native American people in other states belonging to tribes which formerly lived in Arkansas before relocation, and whose names are on the rolls in tribal headquarters, shall be classified as in-state students of Arkansas for tuition and fee purposes, on all campuses of the University of Arkansas. Tribes so identified include the Caddo, Cherokee, Choctaw, Osage, and Quapaw.

### **RESIDENCY STATUS OF MEMBERS OF ARMED FORCES AND DEPENDENTS**

Effective January 1, 1975, members of the Armed Forces who are stationed in the state of Arkansas pursuant to military orders, and their unemancipated dependents, shall be entitled to classification as in-state students for fee paying purposes (per Arkansas State. Ann. 80-3366). Persons continuously domiciled in Arkansas for at least twelve consecutive months who enter active military service from this state and who maintain Arkansas as the permanent home of record while on active military duty, and their dependents\*, shall be entitled to classification as in-state students for fee paying purposes. This provision is forfeited if the military person does not return to Arkansas within twelve months after separation, discharge, or retirement from active duty.

Persons serving in active military service who demonstrate a change of bona fide domicile from another state to Arkansas at least twelve consecutive months prior to separation, discharge, or retirement from active military duty, and their dependents, shall be entitled to classification as in-state students for fee paying purposes. This provision is forfeited if the military person does not return to Arkansas within twelve months after separation, discharge, or retirement from active duty.

### **RESIDENCY STATUS OF STUDENTS FROM TEXARKANA, TEXAS AND BOWIE COUNTY, TEXAS**

In accordance with the reciprocity agreement described in H.C.R. 32, signed by the Governor of Arkansas on February 12, 1965, residents of Texarkana, Texas, and Bowie County, Texas, will be classified as in-state students for university fee purposes at the University of Arkansas for Medical Sciences.

### **ACT 188**

Act 188 of 1973 provides tuition and fees for the surviving dependents of Arkansas citizens who were listed as Missing in Action or Killed in Action, or who were law enforcement officers or firemen killed in the line of duty.

\*For the purpose of this policy, dependents are spouse and unmarried children who are legal dependents of the military person as identified by IRS.

## REFUND POLICY

### Definition of Class Days

Class days start on the date listed on the academic calendar as the date the semester begins. For the purposes of dropping classes, the number of class days specified above refers to the number of calendar days following the day on which classes started (exclusive of weekends and holidays) **regardless of how many, if any, class sessions in a particular course were held.**

### Fall and Spring Semesters Withdrawals

Any student who officially withdraws from the University of Arkansas for Medical Sciences during a FALL OR SPRING SEMESTER shall be entitled to a refund as follows:

#### Registration, Tuition and Fees

- |   |           |
|---|-----------|
| * up to and including five (5) class days   | 100%      |
| * from the sixth (6 <sup>th</sup> ) class day through the tenth (10 <sup>th</sup> ) class day | 50%       |
| * from the eleventh (11 <sup>th</sup> ) class day and after                                   | no refund |

Any student who drops one or more courses during a FALL OR SPRING SEMESTER shall be entitled to individual course refunds as follows:

- |   |           |
|---|-----------|
| * up to and including five (5) class days:              | 100%      |
| * from the sixth (6 <sup>th</sup> ) class day and after | no refund |

### Summer Semester Withdrawals

Any student who officially withdraws from the University of Arkansas for Medical Sciences during a SUMMER SEMESTER shall be entitled to a refund as follows:

#### Registration, Tuition and Fees

- |   |           |
|---|-----------|
| * Prior to start of classes   | 100%      |
| * up to and including three (3) class days  | 100%      |
| * from the fourth (4 <sup>th</sup> ) through the sixth (6 <sup>th</sup> ) class day | 50%       |
| * from the seventh (7 <sup>th</sup> ) and after                                     | no refund |

Any student who drops one or more courses and continues to be enrolled in the University during a SUMMER SEMESTER shall be entitled to a refund as follows:

#### Registration, Tuition and Fees

- |   |           |
|---|-----------|
| * prior to start of classes                         | 100%      |
| * up to and including three (3) class days          | 100%      |
| * the fourth (4 <sup>th</sup> ) class day and after | no refund |

## **REGISTRATION AND RELATED TOPICS**

Graduate school registration occurs three times during each academic year - Fall, Spring and Summer. Currently enrolled students are expected to register during the registration period for each semester and pay tuition and fees by dates specified on the Academic Calendar. Specific registration requirements and forms are posted on the Graduate School website.

Students will not be allowed to register after the last day to pay with a late fee unless permission is granted by the Dean of the Graduate School. This applies to all graduate students regardless of student status, date of first class meeting or class location.

### **Auditing a Course**

When a graduate student takes a course for audit, he/she must register, pay the tuition and fees, and be admitted to class on a space available basis. The instructor shall notify the student of the requirements for receiving the mark of "AU" for the course being audited. The student is responsible for understanding the requirements for receiving an audit in a class. The instructor and the Graduate Dean may drop a student from a course being audited if the student is not satisfying the requirements specified by the instructor. The student will be notified if this action is taken.

Cost for auditing is the same as taking classes for credit. The last day to change from audit to credit is the fifth day of classes. Changing credit to audit must be done during the first one-half of the course. The only grade or mark which may be given is "AU," unless changed to credit.

### **Adding/Dropping Courses**

Graduate students are permitted to add/drop courses whenever approved by the instructor, their advisor, discipline director and the Dean. A course may be dropped during the first 20 class days of the semester without having the mark of "W" (withdrawal) shown on the student's transcript. After the first 20 class days, and before the last 20 class days of the semester, a student may drop a course, but a mark of "W," indicating withdrawal, will be recorded on the student's transcript. A student may not drop a course during the last 20 class days of the semester.

A course may be dropped during the first 10 class days of the summer session without having the mark of "W" (withdrawal) shown on the student's transcript. After the first 10 class days, and before the last 10 class days of the summer session, a student may drop a course, but a mark of "W," indicating withdrawal, will be recorded on the student's transcript. A student may not drop or withdraw from a course during the last 10 class days of the summer session.

### **Credit Hours**

The number of semester credit hours allowed in each course is identical with the number of hours a week spent in regular class recitations and lectures in that course; (one hour is equivalent to a 50 minute contact session) usually, two or three hours of laboratory work will be considered equivalent to one hour of lecture or recitation. This does not apply to clinical courses.

## **Transfer Credits**

The University of Arkansas for Medical Sciences will permit a student to transfer six hours of graduate credit from another accredited graduate school in the United States, provided that the grades are “B” or better and the subjects are acceptable to the department concerned, as a part of the student’s program. The Dean of the Graduate School should be petitioned for requesting transfer of credit hours and may be petitioned on a case by case basis to consider additional transfer credits.

## **Grades and Marks**

Final grades for courses are “A,” “B,” “C,” “D” and “F”. (No credit is earned for courses in which a grade of “F” is recorded.)

A final grade of “F” shall be assigned to a student who is failing on the basis of work completed but who has not completed all requirements. The instructor may change an “F” so assigned to a passing grade if warranted by satisfactory completion of all requirements.

A student who repeats a course in an endeavor to raise a grade must count the repetition toward the GPA. The grade received for repeated course will not replace the previous grade received for that course.

A mark of “I” may be assigned to a student who has not completed all course requirements if the work completed is of passing quality. An “I” so assigned may be changed to a grade provided all course requirements have been completed by the end of the next enrolled semester after receiving the “I.” If the instructor does not report a grade at the end of the student’s next semester of enrollment, the “I” shall be changed to an “F.” When the mark of “I” is changed to a final grade, this shall become the grade for the semester in which the course was originally taken.

A mark of “AU” (Audit) is given to a student who officially registers in a course for audit purposes (see Auditing a Course).

A mark of “CR” (Credit) is given for a course in which the University allows credit toward a degree, but for which no grade points are earned. The mark “CR” is not normally awarded for graduate-level courses but may be granted for independent academic activities. With departmental (or program area) approval and in special circumstances, up to a maximum of six semester hours of “CR” may be accepted toward the requirements for a graduate degree.

For courses designated to be graded on a Pass/No Pass basis, a mark of “P” (Pass) is given for a course for which a student did work of a passing quality. The mark of “P” allows credit toward a degree but no grade points are earned. A mark of “NP” (No Pass) indicates the student did not do work of passing quality, and no credit or grade points are awarded.

A mixing of course letter grades and the mark “S”, “CR,” “P” or “NP” are not permitted in graduate-level courses and are not to be so reported on the Official Final Grade Report. If a letter grade is reported for any student on the Final Grade Report, then all students listed on that report must receive a letter grade (A, B, C, D, or F) or a mark of “I.” A change of grade (from “CR,” “P,” or “NP” to a letter grade) is not permitted for courses in which “CR,” “P,” or “NP” marks are reported.

A mark of “R” (Registered) indicates that the student registered for master's thesis, or doctoral dissertation. The mark “R” gives neither credit nor grade points toward a graduate degree. When the thesis is completed, although a student may have registered for more than the maximum of credit hours required, a letter grade is assigned for 6 credit hours only.

A mark of “S” (Satisfactory) is assigned in courses such as special problems and research when a final grade is inappropriate. The mark “S” is not assigned to courses or work for which credit is given (and thus

no grade points are earned for such work). If credit is awarded upon the completion of such work, a grade or mark may be assigned at that time and, if a grade is assigned, grade points will be earned.

A mark of "W" (Withdrawal) will be given for courses from which a student withdraws after the first 20 class days and before the last 20 class days of the fall and spring semesters or after the first 10 class days and before the last 10 class days of the summer session. (Class days start and end on the date listed on the academic calendar as the date the semester begins or ends. The number of class days specified refers to the number of calendar days following the day on which classes started or preceding the number of calendar days on which classes end (exclusive of weekends and holidays) regardless of how many, if any, class sessions in a particular course were held.) Students may not withdraw from a course during the last 20 class days of the Fall and Spring semesters. Students may not withdraw from a course during the last 10 class days of the Summer semester.

For numerical evaluation of grades, "A" is assigned 4 points for each semester hour of that grade; "B," 3 points; "C," 2 points; "D," 1 point; and "F," 0 points.

### **Academic Dismissal**

A student may be dropped from further study in the Graduate School if at any time his/her performance is considered unsatisfactory as determined by either the program faculty or the Dean of the Graduate School. Academic dishonesty (including cheating, plagiarism and forgery) and/or failure to maintain a specified cumulative grade-point average are considered to be unsatisfactory performance.

If a degree seeking graduate student has less than a 2.85 cumulative grade-point average on 10 or more semester credit hours of course work applicable to a graduate degree program, the student will be placed on academic probation. The student will be dismissed from the Graduate School if the cumulative GPA is not raised to 2.85 or above on the next ten hours of graduate course work approved by the student's program. If at the time a student is placed on academic probation, it is mathematically impossible for the student to raise their GPA to 2.85 on the next ten hours of graduate coursework, the student will be dismissed from the Graduate School.

The graduate faculty of any degree program may establish and state in writing additional requirements for continuation in that program.

### **Administrative Requirement for Graduation**

Application for graduation must be made to the Registrar and the graduation fee paid during registration for the semester in which degree requirements will be completed and graduation projected. If a student fails to complete degree requirements in the projected semester of graduation, the student must contact the Graduate School Office. The graduation fee is a one-time payment and if the student does not graduate as projected, the fee will carry over to the next semester.

### **Withdrawal**

A student who leaves graduate school before the end of a semester or summer session must file and have accepted by the Dean an application for voluntary withdrawal. Application forms for withdrawing are available in the Graduate School Office. Students withdrawing from Graduate School must clear campus by completing a Campus Clearance Form. Forms are available on the Graduate School website. Grades and transcripts will be withheld for withdrawing students who fail to submit a completed Campus Clearance Form to the Graduate School Office.

For students who receive student loans, if you withdraw/separate prior to completing the enrollment period, a Title IV Return of Funds will be processed regarding your Stafford and Grad PLUS Student Loans. Based on federal regulations, funds will be returned to your lender if you terminate prior to the end of the enrollment period. You will be billed for the amount UAMS returns to your lender on your behalf.

## **Attendance**

Students are expected to be diligent in the pursuit of their studies and in their class attendance. Students have the responsibility of making arrangements satisfactory to the instructor regarding all absences. Such arrangements should be made prior to the absence if possible. Policies of making up work missed as a result of absence are at the discretion of the instructor, and students should inform themselves at the beginning of each semester concerning the policies of their instructors.

## **Extended Absence**

The Graduate School does not have a formal leave of absence policy. Any degree seeking student who has not been enrolled for two consecutive calendar years will be considered inactive and will not be allowed to register for subsequent graduate classes. Reinstatement may be granted by the Dean following written request from the student's program. The Dean of the Graduate School may grant an extended absence only upon receiving a written request from the student's program. An extended absence in no way negates the requirement that the M.S. degree must be completed in six consecutive calendar years from the first enrolled semester and the Ph.D. degree must be completed within seven consecutive calendar years from the date the candidacy exam is passed.

## **Graduate School Orientation**

Orientation is held the week preceding fall registration. Information about the University of Arkansas for Medical Sciences and services available to students is presented by representatives from the various departments. Luncheon is provided by the Graduate Student Association and the Dean of the Graduate School. Students are encouraged to attend orientation.

## **Communicative Disorders Program Fees**

Students enrolled in the Communicative Disorders program will incur fees on the University of Arkansas at Little Rock campus in addition to the tuition and fees owed UAMS. Students in this program who fail to pay fees owed UALR will be denied further enrollment in the UAMS Graduate School.

# PROGRAM OF STUDY

## DEGREES OFFERED

The University of Arkansas for Medical Sciences offers the following graduate degrees: Doctor of Philosophy, Master of Science and Certificates

### MASTER OF SCIENCE

The degree of Master of Science (M.S.) is conferred for graduate work of which the major portion has been done in Biomedical Sciences, Communicative Disorders, Clinical Nutrition, Genetic Counseling, Occupational and Environmental Health, and Pharmaceutical Sciences.

### DEGREE REQUIREMENTS

Listed below are the requirements of the UAMS Graduate School for the awarding of the Master of Science degree. Individual graduate programs may have additional program specific requirements for the awarding of the degrees.

Time Frame for Completion of Degree. All requirements for a master's degree must be satisfied within six consecutive calendar years from the date of the first registration.

Grade Point Average and Semester Credit Hours. Thirty (30) semester credit hours and a minimum cumulative grade point of 2.85 on all graduate courses are required. If a student is submitting a thesis, he/she must register for a minimum of six (6) semester credit hours of thesis. When a thesis is completed a letter grade will be reported for six (6) hours of thesis regardless of the total number of thesis hours for which the student registered.

Non Thesis Option. A comprehensive examination is required for students enrolled in a program's non thesis option. The format of the examination is at the discretion of the program. Immediately following successful completion of the examination, the program will submit to the Graduate School Office a written statement indicating that the student passed the examination and that all program degree requirements have been completed.

Thesis Option. A comprehensive examination and public thesis defense are required for students submitting a thesis; the format of the examination is at the discretion of the program. Students submitting a thesis will have a Thesis Advisory Committee consisting of a minimum of three UAMS graduate faculty members. At the time the committee is appointed, notification of the committee membership must be forwarded to the Graduate School Office. After a student presents a written thesis to the Thesis Advisory Committee the committee chair (with the concurrence of the committee) will schedule a thesis defense. Not less than ten days prior to the date of the thesis defense, public notices will be posted by the program announcing the title of the thesis, and the date, time and place of the defense. Two copies of the thesis must be submitted to the library for approval no less than ten class days before the degree is conferred. All signatures on the final copies must be original, and two copies must be submitted unbound. After approval the UAMS library retains two copies.

Notification of Thesis Defense. Once the defense is scheduled, the Graduate School Office should be notified of the date, time and place of the defense.

The thesis must be submitted in accordance with the guidelines contained in a manual, Regulations for Preparing Theses and Dissertations, which is available in the UAMS Bookstore and on the Graduate School website.

A copy of the thesis title page and committee signature page must be submitted by the library to the Graduate School Office prior to the conferring of the degree. The committee signature page must have verification by the UAMS Library that the thesis has been accepted.

Degree Application. A degree application form must be submitted to the Graduate School Office and a graduation fee paid during registration for the semester in which degree requirements will be completed and graduation is projected. The student must contact the UAMS Graduate School Office concerning their projected graduation date. If a student fails to complete the degree requirements on the projected date, the program must contact the Graduate School office.

Campus Clearance. The Graduate School Office will submit a roster of graduates to departments requiring clearance of students for each semester/session. The student will be notified by mail if there are departments to clear. The Graduate School will not issue a diploma and/or requested transcripts for graduates who are not cleared by these departments.

Grades and Transcripts Withheld. Grades and transcripts will be withheld and registration refused to students who fail to return laboratory, library or other university property entrusted to their care; who fail to complete the campus clearance procedure; who fail to comply with rules governing the audit of student organization accounts; or who have failed to pay any fees, tuition, room and board charges, fines or other charges assessed by UAMS.

## **DOCTOR OF PHILOSOPHY**

Programs of advanced study leading to the degree of Doctor of Philosophy (Ph.D.) are offered in the following fields: Communication Sciences and Disorders, Neurobiology and Developmental Sciences, Bioinformatics, Interdisciplinary Biomedical Sciences, Biochemistry and Molecular Biology, Interdisciplinary Toxicology, Microbiology and Immunology, Health Systems Research, Health Promotion and Prevention Research, Nursing Science, Pharmacology, and Cellular Physiology and Molecular Biophysics.

The degree of Doctor of Philosophy is awarded in recognition of high scholarly attainment as evidenced by a period of successful advanced study, the satisfactory completion of certain prescribed examinations, and the development of a dissertation covering some significant aspect of a major field of learning.

Each candidate must complete a doctoral dissertation on some topic in the major field. The completed dissertation must be a definite, scholarly contribution to the major field. This contribution may be in the form of new knowledge of fundamental importance, or of modification, amplification, and interpretation of existing significant knowledge.

## **DEGREE REQUIREMENTS**

Listed below are the requirements of the UAMS Graduate School for the awarding of the Doctor of Philosophy degree. Individual graduate programs may have additional program specific requirements for the awarding of the degree.

Doctor of Philosophy Candidacy Exam. Candidates for the Doctor of Philosophy degree must pass a candidacy examination administered by their program. This examination is normally administered after approximately two years of graduate study; however, the date of the examination is at the discretion of the program. The program will submit the results of the examination to the Graduate School Office immediately following the examination. After the student has passed the Doctor of Philosophy Candidacy Examination, the student must register for at least one credit hour of dissertation for each semester and one credit hour of dissertation for each summer session until the degree is awarded. Registration for a minimum of eighteen semester credit hours of dissertation is required of doctoral degree candidates.

Time Frame and GPA Required for Completion of Degree. After passing the candidacy examination the degree must be completed within seven consecutive calendar years. A minimum cumulative GPA of 2.85 on all course work is required for completion of a degree (Nursing Science Ph.D. students see College of Nursing Handbook).

Doctoral Advisory Committee. A Doctoral Advisory Committee must be appointed immediately after the student passes the candidacy examination, if such a committee has not been previously established. At the time the committee is appointed, notification of the committee membership must be forwarded to the Graduate School Office. The committee will include no fewer than five (5) UAMS Graduate Faculty members, one of whom will be designated as chair. By the program completing the application for outside dissertation committee member and submitting to the Graduate School Office for the Dean's consideration and approval, one person who is not a UAMS Graduate Faculty member may serve as a required committee member but not as chair.

Notification of Dissertation Defense. After a student presents a written dissertation to the Doctoral Advisory Committee, the committee chair (with the concurrence of the committee) will schedule a dissertation defense. Not less than thirty days prior to the date of the dissertation defense, the program should notify the Graduate School and post public notices announcing the title of the dissertation, and the date, time and place of the defense. The Graduate School website will be the official posting mechanism for the thirty day public announcement for all Ph. D. dissertation defenses (Nursing Science Ph.D. students see College of Nursing Handbook).

Approval of Dissertation. Approval of 80% of the Doctoral Advisory Committee is required for acceptance of the dissertation.

Dissertation on File. Three final copies of the dissertation, together with three copies of an abstract of not more than 350 words, must be submitted to the library for approval no less than ten class days before the degree is conferred. All signatures on the final copies and abstracts must be original, and the three copies must be submitted unbound. After approval two copies are retained by the UAMS Library.

The dissertation must be submitted in accordance with the guidelines contained in a manual, Regulations for Preparing Theses and Dissertations, which is available in the UAMS Bookstore and on the Graduate School website.

Verification of Dissertation Acceptance. A copy of the dissertation title page and committee signature page must be submitted to the Graduate School Office prior to the conferring of the degree. The committee signature page must have verification by the UAMS Library that the dissertation has been accepted.

Degree Application. A degree application form must be submitted to the Graduate School Office and a graduation fee paid during registration for the semester in which degree requirements will be completed and graduation projected. If a student fails to complete the degree requirements on the projected date, the program must contact the Graduate School office. The student must contact the UAMS Graduate School Office concerning their projected graduation date.

Campus Clearance. The Graduate School Office will submit a roster of graduates to departments requiring clearance of students, for each semester/session. The student will be notified by mail if there are departments to clear. The Graduate School will not issue any diploma and/or requested transcripts for graduates who are not cleared by these departments.

Grades and Transcripts Withheld. Grades and transcripts will be withheld and registration refused to students who fail to return laboratory, library or other university property entrusted to their care; who fail to complete the campus clearance procedure; who fail to comply with rules governing the audit of student organization accounts; or who have failed to pay any fees, tuition, room and board charges, fines or other charges assessed by UAMS.

## **COMBINED M.D./Ph.D. SCHOLARSHIP PROGRAM**

The combined M.D./Ph.D. is offered to a limited number of highly qualified students who have an exceptional potential for research. Students must first be admitted to the College of Medicine and then separately by the Interdisciplinary Biomedical Sciences graduate program with approval by the M.D./Ph.D. scholarship selection committee.

The M.D./Ph.D. program normally takes 6 to 8 years to complete. The curriculum for the first two years is the standard pre-clinical medical school curriculum. Students may be exempted from introductory Graduate courses covered by pre-clinical basic science courses. Additional coursework will be defined by the student's Ph.D. Major Advisor and Advisory Committee. College of Medicine and Graduate School standards of academic achievement will apply separately for the M.D. and Ph.D. degrees, respectively. MD/PhD students are required to maintain the minimum GPA established by the student's graduate program. Students already enrolled in the Medical School may apply to the M.D./Ph.D. program during their freshman or sophomore years. Students enrolled in the M.D./Ph.D. program are expected to do research in one of the graduate research laboratories/programs during the summers. Students must take and pass Step I of the United States Medical Licensing Examination prior to initiation of full-time graduate study. The graduate program, which is individually tailored to each student's career goals, is expected to take 2 to 4 years and will include advanced coursework, original research under the direction of a faculty advisor and the Ph.D. candidacy examination, and the dissertation defense (final examinations). Students must obtain permission from their dissertation committee before entering the clinical phase of the medical school program. The curriculum for the final 2 years includes required and elective clinical courses. Research electives may be taken to complete graduate work.

# DEGREE PROGRAMS AND COURSES OF INSTRUCTION

## COURSE NUMBERS AND DESCRIPTIONS

The courses of instruction which follow are offered by the Graduate School of the University of Arkansas for Medical Sciences. Each course is identified by a four-digit number which carries the following information:

The first three digits identify the course, the fourth digit indicates semester credit hours.

The letter 'V' is used in place of the last digit for those courses in which credit is variable, the minimum and maximum credit per semester being given in parenthesis after the course title.

As nearly as can be determined in advance, the semester in which each course will be offered is designated by a symbol in parentheses placed immediately after the course title. Courses marked (I) will be offered in the fall semester. Courses marked (II) will be offered in the spring semester. Courses marked (S) will be offered during the summer session.

Where there are prerequisites to a course, these are noted following the description. Students are urged to check prerequisites before enrolling in any course, and to consult their advisers whenever there is any question of prerequisites having been satisfactorily completed.

### Abbreviations of Course Prefixes (Alpha Codes)

<b>ASP</b>	Communicative Disorders
<b>BIOC</b>	Biochemistry and Molecular Biology
<b>BIOF</b>	Bioinformatics
<b>BIOM</b>	Biometry
<b>CSPHD</b>	Communication Sciences and Disorders Doctoral
<b>GENC</b>	Genetic Counseling
<b>GSIC</b>	Graduate School Inter-College
<b>HPPR</b>	Health Promotion and Prevention Research
<b>HSRE</b>	Health Systems Research
<b>IBSD</b>	Interdisciplinary Biomedical Sciences
<b>INTX</b>	Interdisciplinary Toxicology
<b>MBIM</b>	Microbiology and Immunology
<b>NBDS</b>	Neurobiology and Developmental Sciences
<b>NUSC</b>	Nursing Science
<b>NUTR</b>	Clinical Nutrition
<b>OEHM</b>	Occupational and Environmental Health
<b>PHSC</b>	Pharmaceutical Sciences
<b>PCOL</b>	Pharmacology
<b>PHYO</b>	Cellular Physiology and Molecular Biophysics

# BIOCHEMISTRY AND MOLECULAR BIOLOGY (BIOC)

**Wayne Wahls, Ph.D.** • BIOC Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5787

## The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

### PROFESSORS

**Edathara C. Abraham, Ph.D.**  
**Syed F. Ali, Ph.D.**  
**Timothy C. Chambers, Ph.D.**  
**Michael Douglas, Ph.D.**  
**Donald M. Mock, M.D., Ph.D.**  
**Anna Radomska-Pandya, Ph.D.**  
**Kevin D. Raney, Ph.D.**  
**Robert J. S. Reiss, Ph.D.**  
**Wayne Wahls, Ph.D.**

### ASSISTANT PROFESSORS

**Robert L. Eoff, Ph.D.**

### INSTRUCTOR

**Samuel G. Mackintosh, Ph.D.**

### NON-UAMS GRADUATE FACULTY

**Richard Beger, Ph.D. (NCTR)**  
**Ricky Edmondson, Ph.D. (NCTR)**  
**Julian E.A. Leakey, Ph.D. (NCTR)**

### ASSOCIATE PROFESSORS

**Giulia Baldini, M.D., Ph.D.**  
**Donald C. DeLuca, Ph.D. (Emeritus)**  
**Gur P. Kaushal, Ph.D.**  
**Mari Davidson, Ph.D.**  
**Alan B. Diekman, Ph.D.**  
**Masahiro Higuchi, Ph.D.**  
**Fusun Kilic, Ph.D.**  
**Grover Paul Miller, Ph.D.**  
**Alan J. Tackett, Ph.D.**

## PROGRAM DESCRIPTION

The Department of Biochemistry and Molecular Biology at the University of Arkansas for Medical Sciences offers programs of instruction leading to the Master of Science and/or the Doctor of Philosophy degrees in Biochemistry and Molecular Biology. The departmental research interests encompass the study of life processes at the molecular level including glycoprotein and glycoconjugate synthesis and regulation, eukaryotic and prokaryotic transcription and translation, enzyme catalysis and mechanisms, molecular and developmental genetics and epigenetics, molecular biology of aging and cancer, membrane function and targeting, xenobiotic metabolism and detoxification, mitochondrial function, and reproductive biology. Because of the breadth of training in our graduate program, our graduates have job opportunities in university and medical school research centers, as well as many applied areas such as pharmaceutical and biotechnology industries, clinical laboratories and environmental testing laboratories.

Our program in Biochemistry and Molecular Biology consists of a series of courses that are usually completed by the end of the second year, evaluation of a student's working knowledge of biochemical principles by a candidacy examination, and, where applicable, completion of a research thesis or dissertation. The graduate faculty of the department is well qualified to provide the research experience that is essential to the development of the student for a career as an independent scientist. More detailed information about the research interests of individual faculty members can be obtained by contacting the graduate program director of the department or visiting the web site at [www.uams.edu/biochem/](http://www.uams.edu/biochem/).

### **Degrees Conferred: M.S., Ph.D. (BIOC)**

The program provides instruction leading to the degrees of Master of Science and/or Doctor of Philosophy in Biochemistry and Molecular Biology. Following a student's first year course sequence, a specific curriculum will be developed by the student and his/her advisory committee. This committee is comprised of the student's faculty research advisor and other graduate faculty members as appropriate for a student's degree program. It will meet at least twice a year to assess a student's progress. The Department of Biochemistry and Molecular Biology will usually provide stipend support for Ph.D. degree candidates, but stipends are not available for M.S. degree candidates.

**Areas of Concentration:** Cancer biology, glycobiology, aging and development, DNA replication and recombination, signal transduction, transcription, translation, metabolism, enzyme mechanisms, bioenergetics, chromatin structure and remodeling, proteomics and systems biology, and molecular biology.

**Prerequisites to Degree Program.** In addition to a Bachelor of Science or Arts degree in a biological science, chemistry or biochemistry, and the stated admission requirements of the Graduate School, results of the verbal, quantitative and analytical sections of the Graduate Record Examinations must be provided. Undergraduate grade point average and course transcripts, GRE scores and letters of evaluation from at least three former instructors will be evaluated by the Departmental Admissions Committee. Although not necessary for admission, related work experience will also be considered when applicable. Candidates for admission should have at least a "B" average in science and math courses.

**Requirements for the Master of Science Degree.** The Master of Science degree program is designed to be completed within, but is not limited to, two years. Two tracks to the M.S. degree are available, including a research-based thesis degree as well as a non-thesis degree. The M.S. degree will be awarded upon completion of all general requirements of the Graduate School, satisfactory performance in courses required by the advisory committee, and successfully defending an original research thesis or passing a comprehensive examination, depending upon track chosen. Most students enroll in a research track that requires an original thesis based on his/her research work. Optionally students may elect a non-thesis track, in which case they take additional didactic course work.

**Requirements for the Doctor of Philosophy Degree.** The degree of Doctor of Philosophy is awarded in recognition of high scholarly attainment as evidenced by a period of successful, advanced study. The Ph.D. degree program is designed to normally require a minimum of four years. The Ph.D. degree will be awarded after completion of all general requirements of the Graduate School, satisfactory performance in courses required by the department and the advisory committee, passing of a Ph.D. candidacy exam, and presentation and successful defense of an original dissertation based on a student's research work. In the first year, students enroll in didactic courses and conduct research rotations in four laboratories. A student chooses his/her major advisor and dissertation research project after completion of the first year. The second year curriculum includes didactic courses, laboratory research, and the doctoral candidacy exam. Following passage of the candidacy exam, subsequent years are focused predominantly upon experimental research, culminating in the development and defense of a written dissertation covering a significant aspect in the field of study.

### **Biochemistry and Molecular Biology (BIOC)**

**BIOC 500V** **Medical Biochemistry.** Presentation of biochemical principles and their application in biomedical science.

**BIOC 503V** **Biochemistry Seminar.** Required every fall and spring semester a student is enrolled in a departmental graduate program. Students presenting a seminar during a semester register for two (2) credit hours. Seminars are developed in consultation with a faculty member. Students whose program does not require a seminar presentation during a particular semester register for one (1) credit hour.

- BIOC 504V** **Biochemical Methods.** Focuses on the application of biochemistry and molecular biology concepts to quantitative measurements in biological systems. Includes the principles of separation science, electrochemistry, enzyme and metabolic kinetics, spectroscopy, radiochemistry, and immunochemistry. Emphasis is placed on experimental design and data interpretation.
- BIOC 506V** **Research in Biochemistry.** Practical experience in experimental design and manipulation. A written progress report describing objectives and accomplishments must be discussed with the research director and advisory committee at, or prior to, the time of grade submission.
- BIOC 5103** **Biochemistry and Molecular Biology.** A broad presentation of basic biochemistry and molecular biology as background for students in multiple graduate programs in the biomedical field. Prerequisites: Organic chemistry and college algebra or consent of course director.
- BIOC 5203** **Biological Chemistry.** An in-depth treatment of topics considered in BIOC 5103 with special emphasis on enzyme structure-function relationships, metabolic integration and regulation, and intracellular signaling. Coursework is based predominantly upon critical analysis of peer-reviewed scientific publications.
- BIOC 600V** **Master's Thesis.** Includes experimental and literature-based research, plus preparation of thesis. Prerequisite: graduate standing and consent of advisory committee.
- BIOC 6021** **Research Proposal.** Students in the Ph.D. degree program will write a formal research proposal in the area of their dissertation research. Advice and direction for the preparation of this proposal will be provided by the student's major advisor and advisory committee. Prerequisite: consent of advisory committee.
- BIOC 604V** **Special Topics in Biochemistry.** In-depth consideration of topics of current research importance and specialized subjects not covered in general courses. Topics vary by year. Representative topics include: enzymology, proteomics, chromosome dynamics, cancer biology, signal transduction, glycobiology, structure and function of membranes, bioorganic catalysis. May be taken for multiple credit to a maximum of 6 hours.
- BIOC 6122** **Biology of Cancer.** Molecular and cellular aspects of cancer biology with special emphasis on the acquired capabilities of cancer cells and how this information is translated into innovative treatment strategies. Prerequisites: successful completion of first-year core graduate courses or consent of course director.
- BIOC 700V** **Doctoral Dissertation.** Includes experimental and literature-based research, plus preparation of dissertation. Prerequisite: successful completion of Ph.D. candidacy exam.
- BIOM 5013** **Biostatistics I** Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, non-parametric tests, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments. Prerequisite, consent
- NBSD 5093** **Cell Biology.** The structure and function of cells and cellular organelles with particular attention to how these interact in larger units of organization. Prerequisite: CHEM 3813, its equivalent, or consent of course director.

**PCOL 5211**     **Scientific Communication and Ethics I.** Formal training in scientific communication and ethics for students in the first and second years of graduate school. Various faculty within and outside the department will lead discussions concerning ethical conduct related to scientific publishing. Students will also prepare an oral presentation of recent peer reviewed research.

**PCOL 5221**     **Scientific Communication and Ethics II** This course will provide additional formal training in scientific communication and ethics. Prerequisite: PCOL 5211.

**PHYO 5143**     **Gene Expression.** Focuses on the various processes involved in the flow of information from genes to their expressed products. Regulation of these processes will be explored in depth for both prokaryotic and eukaryotic systems. Topics will include: Genome organization, DNA replication and recombination, transcription, RNA processing translation, genomics and proteomics, differentiation and development. Prerequisite: Consent of the instructor.

## BIOINFORMATICS (BINF)

**Steven F. Jennings, Ph.D., M.B.A.**, BINF Graduate Program Director  
UALR, EIT 303, 2801 South University Avenue, Little Rock, AR 72204; 501-569-8216

**Helen Beneš, Ph.D.**, BINF Graduate Program Associate Director  
UAMS, 4301 West Markham, Slot 510, Little Rock, AR 72205; 501-686-5782

**William R. Hogan, M.D.**, BINF Graduate Program Liaison  
UAMS, 4301 West Markham, Slot 782, Little Rock, AR, 72205, 501-603-1246

The University of Arkansas at Little Rock (UALR) and the University of Arkansas for Medical Sciences (UAMS) jointly offer master's (M.S.) and doctoral (Ph.D.) degrees in bioinformatics. Combining the academic, clinical, and research resources of UAMS with the academic, computational, and research capabilities of UALR, this program prepares students to function in an interdisciplinary research environment. For more information, visit the bioinformatics graduate program's web site at <http://bioinformatics.ualr.edu/grad>.

**The Faculty (Faculty with primary appointments at UALR can be found at the above website)**

### PROFESSORS

**Helen Beneš, Ph.D.**  
**Mario Cleves, Ph.D.**  
**Cesar Compadre, Ph.D.**  
**Joshua Epstein, Ph.D.**  
**Wayne Gray, Ph.D.**  
**Martin Hauer-Jensen, M.D., Ph.D.**  
**Kim Light, Ph.D.**  
**Curtis L. Lowery, M.D.**  
**Thomas Kieber-Emmons, Ph.D.**  
**Donald Mock, Ph.D.**  
**Kevin D. Raney, Ph.D.**  
**Robert J. S. Reis, Ph.D.**  
**Paula K. Roberson, Ph.D.**  
**Larry Suva, Ph.D.**

### ASSOCIATE PROFESSORS

**Joseph Chacko, M.D.**  
**Philip Breen, Ph.D.**  
**Richard Edmondson, Ph.D.**  
**Hari Eswaran, Ph.D.**

### ASSOCIATE PROFESSORS (continued)

**William R. Hogan, M.D., M.S.**  
**David Nelsen, M.D.**  
**Michael Soulsby, Ph.D.**  
**Alan Tackett, Ph.D.**

### ASSISTANT PROFESSORS

**Marjan Boerma, Ph.D.**  
**Galina Glazko, Ph.D.**  
**Damir Herman, Ph.D.**  
**Radhakrishnan Nagarajan, Ph.D.**  
**Songthip, Ounpraseuth, Ph.D.**  
**Elvin Price, Ph.D.**

### NON UAMS GRADUATE FACULTY

**Richard Beger, Ph.D., NCTR**  
**John Bowyer, Ph.D., NCTR**  
**Barbara Clancy, Ph.D., UCA**  
**Tucker Patterson, Ph.D., NCTR**  
**William Slikker, Ph.D., NCTR**  
**Weida Tong, Ph.D., NCTR**

\*UALR is the host institution for this joint program. UALR and UAMS faculty are listed at the following website: <http://bioinformatics.ualr.edu/faculty>.

**Degrees Conferred: M.S, Ph.D.**

**Prerequisites to Degree Program.**

Applicants must be approved by the Bioinformatics Admissions Committee and admitted by the UALR Graduate School. Information about admissions may be found at <http://ualr.edu/gradschool/> or by calling 501-569-3206. Information about the program can be found at <http://bioinformatics.ualr.edu/grad> and <http://bioinformatics.ualr.edu/gradadmit>.

Applicants are expected to have an undergraduate degree (B.S. or B.A.) in the life sciences, statistics, or information/computer sciences. Students with an undergraduate degree in another field may be considered for admission if they have either relevant work experience in one of these three areas or complete sufficient remedial coursework as defined below. Students who have not satisfactorily completed the following courses, or their equivalent, as part of their academic studies will be required to complete them on a remedial basis:

Genetics

Equivalent to UALR's *BIOL 3300 Genetics* course, a junior-level life science course

Statistics

Equivalent to UALR's *STAT 3352 Applied Statistics I* course, a junior-level, calculus-based course

Programming

Some programming experience; a sophomore-level introduction to Java programming equivalent to UALR's *IFSC 2300 Object-Oriented Technology* course is preferred

Databases

Equivalent to UALR's *IFSC 3320 Database Concepts* course, a junior-level course

Students will have to meet the minimum admission requirement of a GPA 3.0 overall or of 3.3 or better on their last 60 credit hours as an undergraduate. GRE Scores, transcripts, a letter of intent, and letters of reference are considered in the admission process; TOEFL scores are required of international students who have not matriculated from a university in a country whose primary language is English.

### Requirements for the Master of Science Degree

The **M.S. Program** is built around four cores: bioinformatics, biostatistics/modeling/simulation, information/computer science, and the life sciences. Students must complete thirty-eight (38) credit hours consisting of a minimum of two, approved, graduate-level courses in each of the biostatistics/modeling/simulation, information/computer science, and life science cores. Additionally, students are required to participate in four research lab rotations for two credits and to complete the following bioinformatics courses, including a major research or capstone project:

BINF 7193 Biosciences and Bioinformatics Seminar (for four semesters).

BINF 5445 Bioinformatics Theory and Applications.

BINF 7295 Practical Topics in Science Management.

BINF 8445 Bioinformatics Master's Capstone Project.

Transferability of credit is determined by the Program Director, based upon the applicability of the courses to the student's educational goals and research project. Transfer of credit may not be granted when courses have been used to meet other degree requirements. Additionally, students with relevant graduate degrees in related fields may petition the Program Director for an Advanced Placement which reduces the total credits required for a Master's degree to thirty-two (32). M.S. students are advised by the Program Director and have two additional advisors for their capstone research project.

### Requirements for the Doctor of Philosophy Degree

The **Ph.D. Program** requires that students first complete an M.S. degree in bioinformatics with a grade of "A" on the student's Bioinformatics Master's Capstone Project. After these requirements have been completed, the student may then apply for continuation in the Ph.D. Program. Four additional semesters of BINF 7193 Bioinformatics Seminar and a minimum of 32 credit hours of research complete the Ph.D. Program culminating in the successful defense of the student's dissertation research.

Within the first six months of entering the Ph.D. Program, students must have approved Advisory Committees and defend their dissertation proposals as part of their Candidacy Examination. The approved Advisory Committee must consist of a minimum of four participating UALR/UAMS faculty members representing three of the same four cores, defined for the M.S. Program, plus one external advisor. During

the first eight months, post-M.S., Ph.D. candidates must complete and successfully present a grant proposal related to their research topics.

**UAMS Courses Applicable to the Joint UALR/UAMS  
Bioinformatics Program\*\***

- BIOC 5103**     **Biochemistry and Molecular Biology** A broad presentation of basic biochemistry and molecular biology as a background for other graduate programs in the biomedical field. Prerequisites: General and Organic Chemistry and College Algebra
- BIOM 5013**     **Biostatistics I** Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, non-parametric test, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments.
- BIOM 5023**     **Biostatistics II** Non-parametric analyses of variance. Multiple regression and linear models for analysis of variance. Experimental designs (randomization, data handling, analysis) with factorial treatment arrangements, repeated measures and multiple covariates. Introduction to logistic regression and survival analysis.
- BIOM 5033**     **Biostatistics III** Survival analysis with covariates and grouping factors. Introduction to non-linear regression and pharmacokinetic models. Multivariate regression and multivariate analysis of variance. Principle component and factor analysis. Introduction to clustering and classification methods. Introduction to time series. Prerequisite: BIOM 5023.
- NBDS 5093**     **Cell Biology** The structure and function of cells and cellular organelles with particular attention to how these interact in larger units of organization.
- PHYO 5143**     **Gene Expression** The focus of this course will be on the various processes involved in the flow of information from genes to their expressed products. Regulation of these processes will be explored in depth for both prokaryotic and eukaryotic systems. Topics will include: Genome organization, DNA replication and recombination, transcription, RNA processing, translation, genomics and proteomics, differentiation and development.
- BIOC 604V**     **Special Topics in Biochemistry** Genetics of Human Diseases
- BIOC 604V**     **Special Topics in Biochemistry** Proteomics
- INTX 5082**     **Oncology Introduction to Oncology (II)** Lectures, assigned readings and examinations regarding the molecular basis of carcinogenesis. Emphasis is placed on in-depth study of chemical carcinogenesis and factors mediating the oncogenic response. The role of host-factors and techniques for assessment of carcinogenic risk are presented.
- PATH 5043**     **Molecular and Biochemical Pathobiology** Designed for graduate students in basic science and health related fields seeking an introduction to the principles of general pathology. The pathophysiology of selected diseases will be discussed in depth, with a focus on the molecular and biochemical mechanisms involved. Through discussions of published research, students will develop an appreciation of how basic and clinical research contribute to the understanding and treatment of specific diseases. Prerequisite: Consent of instructor.

## BIostatistics (BIOM)

**Paula K. Roberson, Ph.D.** • Chair of Biostatistics  
4301 W. Markham, Slot 781, Little Rock, AR 72205 296-1556

### The Faculty

There are currently no graduate programs in Biostatistics, however, faculty in the Department of Biostatistics are active participants in a number of graduate student thesis/dissertation committees.

#### PROFESSOR

Ralph L. Kodell, Ph.D.  
Jeannette Y. Lee, Ph.D.  
Paula K. Roberson, Ph.D.

#### ASSISTANT PROFESSOR

Reid Landes, Ph.D.  
Page Moore, Ph.D.  
Songthip Ounpraseth, Ph.D.

#### ASSOCIATE PROFESSOR

Zoran Bursac, Ph.D.  
John M. Tilford, Ph.D.  
David K. Williams, Ph.D.

### Degree Conferred: (None)

Courses in Biostatistics may be applied toward graduate degree programs in other disciplines with the permission of the student's adviser.

## BIostatistics (BIOM)

- BIOM 5013** **Biostatistics I** Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, non-parametric tests, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments. Prerequisite, consent.
- BIOM 5023** **Biostatistics II (Advanced Linear Models)** Non-parametric analyses of variance, multiple regression, linear models, experimental designs, introduction to logistic regression, and survival analysis. Prerequisite: Biostatistics I
- BIOM 5033** **Biostatistics III (Multivariate Analysis and Linear Models)** Survival analysis with covariates, repeated measures designs. Multivariate linear models, principal components, factor analysis, clustering methods, and introduction to non-linear regression. Prerequisite: Biostatistics II.
- BIOM 5043** **Introduction to Biomedical Computing** Introduction to computers and experience in basic programming on a programmable calculator; the higher-level language of FORTRAN is introduced, with applications in biomedical field.
- BIOM 5053** **Theory of Statistics I** (On demand) Introduction to the mathematical foundations of statistical theory. Probability, probability models, density and distribution functions, mathematical expectation, conditional distributions, stochastic independence, special distributions, transformations of variables, moment-generating functions, interval estimations, order statistics. Prerequisite: integral calculus.

- BIOM 5063**     **Theory of Statistics II** (On demand) Continuation of Theory of Statistics I. Limiting distribution, stochastic convergency, the central limit theorem, point estimation, sufficiency, completeness, uniqueness, maximum likelihood, decision functions, Bayesian procedures, test of hypotheses, the multivariate normal distribution, analysis of variance. Prerequisite: BIOM 5053.
- BIOM 5073**     **Theory of Statistics III** (On demand) Continuation of Theory of Statistics I and II with emphasis on the theory of distribution. Sample spaces and events, field of sets, probability measure, random variables, integration of random variables, conditional random variables, i-dimensional random variables, characteristic functions, finite population theory, sequential analysis, time series analysis. Prerequisite: BIOM 5063.
- BIOM 5083**     **Mathematical Biology I** (On demand) Mathematical descriptions of certain physiological systems, respiratory control system, partial models of the cardiovascular system, models of the osmoregulatory system. Prerequisite: integral calculus and consent.
- BIOM 5093**     **Linear Statistical Models** (On demand) Distribution of quadratic forms, linear models, polynomial models, linear hypotheses of full rank, experimental design models, solutions of linear hypotheses in experimental design models, variance components (Same as STAT 5363). Prerequisite: BIOM 5023, 5063.
- BIOM 5103**     **Sampling** (On demand) Fundamental techniques used in conduction of sample surveys. Includes the concepts of simple random, stratified random, cluster, systematic, and multistage sampling. Design of optimum sampling plans for desired precision and/or cost constraints. Application to medical research problems is emphasized. Prerequisite: BIOM 5013, and consent.
- BIOM 5113**     **Nonparametric Methods** (On demand) Comparison of parametric and nonparametric methods, choice of statistical model and method of analysis, practice in the use of various nonparametric techniques in the analysis of experiments involving one or more samples, and nonparametric methods of correlation. Prerequisite: BIOM 5013.
- BIOM 512V**     **Special Topics in Biostatistics (1-3)** (On demand) Advanced work in specialized fields such as bioassay, multivariate analysis, time series, etc. Credit, 1 to 3 hours per semester, limit of 9 hours. Prerequisite: consent.
- BIOM 5131**     **Biometry Seminar** Prerequisite: graduate standing and consent.
- BIOM 5133**     **Statistical Methods for Clinical Trials** Principles underlying the planning, management, and implementation of modern clinical trials, the application of statistical methods used in the analysis of data from clinical trials and the interpretation of results. Basic statistical techniques used in design and analysis of Phase I-III single-and multi-center trials. Recommended prerequisites: basic statistics, SAS software. Prerequisite: BIOM 5013 and consent.
- BIOM 5143**     **Health Care Economics - Theory and Quantitative Analysis** Basic concepts in economic theory and analysis applied to health care including supply and demand, theory of markets, economic efficiency, and organization theory. Resource allocation in health care including demand for medical care, supply of medical care, markets for health manpower, capital markets and hospital construction, and resource allocation in non-profit institutions. Prerequisite: prior or concurrent course in statistics.
- BIOM 5153**     **Quantitative and Economic Studies in Health Care Policy** Introduction to cost-benefit analysis, medical care financing, government health care programs, regulation, costs and inflation. Prerequisite: BIOM 5143.

- BIOM 5163** **Descriptive and Quantitative Studies in Health Planning and Systems** Introduction to health planning, history and development of health planning, current health delivery system, alternative models in the United States and comparative studies of the health care delivery systems of other selected nations. Prerequisite: BIOM 5143.
- BIOM 5173** **Epidemiology I** An introduction to epidemiology and the basic principles and methods of epidemiological research and practice. Overview of the history and the theoretical basis of epidemiology; measures of morbidity, mortality, disease transmission and risk; major study designs; measures of association; bias, confounding and interaction; evaluation of screening tests; inference; casualty.
- BIOM 5183** **Epidemiology II** Extends consideration of concepts, methods and strategies introduced in Epidemiology I. The course focuses on methodologic tools and skills needed to conduct or evaluate epidemiologic research and emphasizes tools and skills related to study design and data collection. **Prerequisites: Epidemiology I and Biostatistics I or equivalents; Biostatistics II is strongly recommended and may be taken concurrently with Epidemiology II; this prerequisite may only be waived with the instructor's permission.**
- BIOM 5193** **Epidemiology III** Extends consideration of concepts, methods, and strategies introduced in Epidemiology I and II. The course focuses on methodologic tools and skills needed to conduct or evaluate epidemiologic research and emphasizes tools and skills related to data analysis and interpretation. **Prerequisites: Epidemiology I and Epidemiology II; Biostatistics I and Biostatistics II.**

# CELLULAR PHYSIOLOGY AND MOLECULAR BIOPHYSICS (PHYO)

**Richard C. Kurten, Ph.D.**, PHYO Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5123

## The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

### PROFESSORS

Susan Allen, Ph.D.  
Thomas M. Badger, Ph.D.  
Max L. Baker, Ph.D.  
Michael Borrelli, Ph.D.  
John Carroll, M.D.  
Parimal Chowdhury, Ph.D.  
Lawrence E. Cornett, Ph.D.  
Gerald A. Dienel, Ph.D.  
William J. Evans, Ph.D.  
Dana Gaddy, Ph.D.  
W. Sue Griffin, Ph.D.  
Mark Heulitt, M.D.  
Michael L. Jennings, Ph.D.  
Stacie M. Jones, M.D.  
Nicholas P. Lang, M.D.  
Angus MacNicol, Ph.D.  
Robert E. McGehee, Jr., Ph.D.  
Judit Megyesi, M.D.  
Jawahar Mehta, M.D.  
Peter Price, Ph.D.  
Robert Safirstein, M.D.

### PROFESSORS (continued)

Frank A. Simmen, Ph.D.  
Rosalia C.M. Simmen, Ph.D.  
Brendan Stack, M.D.  
Brian Storrie, Ph.D.  
Larry Suva, Ph.D.  
Billy Thomas, M.D.  
K.I. Varughese, Ph.D.  
Jerry Ware, Ph.D.  
Jeanne Wei, M.D., Ph.D.  
Patricia Wight, Ph.D.

### ASSOCIATE PROFESSORS

Howard H. Conaway, Ph.D.  
Richard C. Kurten, Ph.D.  
Vladimir Lupashin, Ph.D.  
William A. Nagle, Ph.D.  
Michael E. Soulsby, Ph.D.  
Shmuel Yaccoby, Ph.D.

### ASSISTANT PROFESSORS

Roy Morello, Ph.D.

## Program Description

The Department of Physiology and Biophysics offers graduate training leading to the M.S. and Ph.D. degrees. Degree programs are designed to offer students a wide range of opportunities in the study of biological function at the level of the gene, protein, organelle, cell, tissue, organ system or intact organism. For all students, the curriculum includes required coursework, seminars, and conferences to establish fundamental concepts in disciplines related to Physiology. M.S. students may pursue their degree in either a thesis or non-thesis track. Students in the thesis track must complete and defend a thesis. M.S. students in the non-thesis track must pass a written comprehensive examination by the end of their second year. Ph.D. students can enter one of two tracks: Physiology & Biophysics or Neuroscience. Within a track, Ph.D. students are able to select from a range of courses according to their interests and career goals. To facilitate selection of a research advisor, Ph.D. students rotate through three laboratories during the first year. All Ph.D. students must pass a combined written and oral qualifying examination prior to beginning their dissertation research under the direction of their research advisor. Doctoral students usually complete their graduate work in five years and typically take a postdoctoral position before establishing a research or teaching career in academia, industry or government.

**Prerequisites for Admission into the Department's Degree Program** – Students qualified for admission to Graduate School must have taken the following undergraduate courses: general chemistry, organic

chemistry, calculus, physics, and a year or more of life science courses. A deficiency in any area can be defrayed by demonstrating advanced coursework in other disciplines of science. It is strongly recommended that students also take biochemistry as an undergraduate. Prospective students must present the following credentials: official transcripts for all undergraduate and graduate coursework; official Graduate Record Examination (GRE) results, three letters of recommendation from individuals familiar with the applicant; and a statement of the applicant's career goals and reasons for seeking a graduate degree.

### **Degrees Conferred: M.S., Ph.D., (PHYO)**

#### **Master of Science Degrees**

In order to accommodate students with varying career goals, two different tracks leading to a Masters of Science degree in Physiology and Biophysics are available:

<b>Thesis Track</b>	<b>Non-Thesis Track</b>
24 Semester Hours of Coursework	30 Semester Hours of Coursework
Thesis	Written Comprehensive Examination
Thesis Defense	

**Thesis Track:** PHYO 5013, 504V, 5051, 5063, BIOC 5103, completion of a written comprehensive examination, and a thesis based upon laboratory research work are required. Additional graduate courses in physiology, pharmacology, biochemistry, anatomy, pathology, or microbiology may be chosen to complete the general requirements of the Graduate School. Students are expected to participate in Physiology - Biophysics Seminar series during each semester that they are enrolled. Specific requirements are as follows:

1. Students must complete a minimum of 24 semester hours of coursework which may include up to four (4) semester hours of Physiology-Biophysics Seminar (PHYO 5051).
2. Students must complete a thesis based on laboratory research work. The student's research is directed by the student's research advisor and thesis committee. The thesis must be presented as a public seminar and then defended in a closed meeting with the student, the student's research advisor and the thesis committee.
3. Students are responsible for meeting the requirements of the Department of Physiology and Biophysics for the M.S. degree and all University requirements and deadlines.

**Non-Thesis Track:** PHYO 5013, 5051, 5063, and BIOC5103 as well as successful completion of a written comprehensive examination. Additional graduate courses in physiology, pharmacology, biochemistry, anatomy, pathology, or microbiology may be chosen to complete the general requirements of the Graduate School. Students are expected to participate in Physiology - Biophysics Seminar series during each semester that they are enrolled. Specific requirements are as follows:

1. Students must complete a minimum of 30 semester hours of coursework which may include up to four (4) semester hours of Physiology-Biophysics Seminar (PHYO 5051)
2. A written comprehensive final examination is taken upon completion of the student's coursework. The Graduate Program Committee administers the examination which principally tests the student's knowledge of Physiology and Biophysics, but may also cover topics to which the student was exposed in other courses.
3. Students are responsible for meeting the requirements of the Department of Physiology and Biophysics for the M.S. degree, and all University requirements and deadlines.

**Requirements for the Doctor of Philosophy Degree.** As a part of the doctoral study, students are expected to participate in the Physiology - Biophysics Seminar series during each semester that they are enrolled. Specific requirements are as follows:

1. Students in the Ph.D. program must complete a minimum of 30 semester hours of coursework which includes up to four (4) semester hours of Physiology-Biophysics seminar (PHYO 5051) and two (2)

semester hours of Scientific Communications and Ethics (PCOL 5221). Doctoral candidates must also successfully complete the following required courses: General Physiology (PHYO 5013), Gene Expression (PHYO 5143), Biochemistry and Molecular Biology (BIOC 5103), Cell Biology (NBDS 5093) or Molecular Cell Biology (MBIM 6104), and a graduate level statistics course (e.g., BIOM 5013). Students in the Physiology and Biophysics track are required to complete Molecular Biophysics I (PHYO 5063). Current program requirements are posted on the Departmental website ( <http://www.uams.edu/physiology/phdrequire.htm> ).

2. A combined written/oral comprehensive examination which serves as the Ph.D. candidacy (qualifying) examination is taken upon completion of the student's coursework – no later than by the end of the student's second year in the program. The student's dissertation advisory committee and other Physiology and Biophysics faculty members as needed are responsible for administering the examination which involves the preparation and discussion of an NIH style grant application as well as an oral evaluation of the student's knowledge of Physiology and Biophysics and other topics to which the student is exposed in coursework, seminars, and research.
3. Ph.D. candidates must complete a doctoral dissertation based on original laboratory research work. The student's research is directed by the student's research advisor and dissertation advisory committee. The doctoral dissertation must be presented as a public seminar and then defended in closed meeting of the student, the student's major advisor, and the dissertation committee.
4. Students are responsible for meeting the requirements of the Department of Physiology and Biophysics for the Ph.D. degree and all other University requirements and deadlines.

**Interdisciplinary Track in Neuroscience.** The Department of Physiology and Biophysics offers a program of study leading to a Ph.D. in Physiology and Biophysics with emphasis in Neuroscience. Faculty with expertise in various disciplines including Anatomy and Neurobiology, Microbiology and Immunology, Pharmacology, and Physiology and Biophysics provide students with comprehensive training in diverse areas of neurobiology. Degree requirements are the same as described in the traditional pathway leading to a Ph.D. degree in Physiology and Biophysics except that students are required to take six hours of coursework from the approved neuroscience electives and are not required to complete Molecular Biophysics I (PHYO 5063). Current program requirements are posted on the Departmental website ( <http://www.uams.edu/physiology/phdrequire.htm> ).

## **CELLULAR PHYSIOLOGY AND MOLECULAR BIOPHYSICS (PHYO)**

- PHYO 5012**     **Protein Crystallography and Protein Structure (I)** The goal of this course is to provide a basic knowledge for analyzing molecular structure using x-ray crystallographic techniques. The topics will include the general principles of x-ray diffraction, crystallization techniques and model building. The course is also intended to give the students an insight into structure-function relationships of biological molecules.  
Prerequisite: consent of instructor
- PHYO 5013**     **General Physiology (II)** consists of lectures, demonstrations, and computer-based laboratories exercises designed to teach the general principles of physiology.
- PHYO 5033**     **Cellular Endocrinology (I)** covers general endocrinology, both anatomical and physiological. Students will prepare a term paper on a selected area in the field.  
Prerequisite: PHYO 5013 and consent.
- PHYO 504V**     **Research in Physiology (I, II)** is conducted under a faculty mentor or dissertation advisor after the completion of required coursework. Subjects of research will vary depending on the faculty research interests.
- PHYO 5051**     **Physiology-Biophysics Seminar (I, II).** Seminars are held one hour per week. Faculty leaders select the topics and graduate students prepare presentations one or more times each semester.

- PHYO 5063** **Molecular Biophysics I (II)** is a scientific literature-based discussion focused on the formation and maintenance of protein structure in the cellular environment; specifically, biophysical aspects of protein folding and misfolding. Publications selected cover both theoretical and experimental aspects of protein folding *in silico* and *in vitro*. Folding *in vivo* includes topics such as cotranslational folding, trans-membrane transport and integration, macromolecular crowding, the role of molecular chaperones, and the biological consequences of misfolding (aggregation; conformational diseases).
- PHYO 5092** **Laboratory Animal Techniques** (on demand) consists of lectures and practical laboratory exercises involving methods of drug administration, methods of anesthesia, experimental surgery, and the use of physiological recording devices. Prerequisites: Comparative or Mammalian Anatomy or equivalent and PHYO 500V.
- PHYO 5143** **Gene Expression (I)**. The focus of this course is on the various processes involved in the flow of information from genes to their expressed products. Regulation of these processes will be explored in depth for both prokaryotic and eukaryotic systems. Topics will include: Genome organization, DNA replication and recombination, transcription, RNA processing, translation, genomics and proteomics, differentiation and development. Prerequisite: consent of instructor
- PHYO 600V** **Master's Thesis (1-6)** (I, II, S) Prerequisite: graduate standing and preceptor consent.
- PHYO 601V** **Selected Reading in Physiology (1-3)** (I, II) consists of assigned reading in various aspects of physiology with an emphasis both on the historical development of physiological thinking and rapidly developing fields of current interest. Prerequisite: consent of instructor
- PHYO 6073** **Basic Biology of Aging (II)** This course provides an overview of the current understanding of the biology of aging. The focus will be on concepts pertaining to organismal aging. Areas covered include: theories of aging, aging models, genomics and proteomics in aging, and oxidative stress and aging. Prerequisite: consent of instructor
- PHYO 700V** **Doctoral Dissertation (1-10)** (I, II, S) Prerequisite: Admission to Ph.D. candidacy and dissertation committee consent.

## **CLINICAL NUTRITION (NUTR)**

**Reza Hakkak, Ph.D.**, NUTR Graduate Program Director  
UAMS, 4301 West Markham, Little Rock, Arkansas 72205, 501-686-6166

### **The Faculty**

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### **PROFESSORS**

**Nicolaas Deutz, Ph.D.**  
**Reza Hakkak, Ph.D.**  
**Maxine Hinton, Ph.D. (Emeritus)**  
**Donald Mock, M.D., Ph.D.**

#### **ASSOCIATE PROFESSORS**

**Margaret L. Bogle, Ph.D., R.D.**

#### **ASSISTANT PROFESSOR**

**Jensen, Joseph, M.D.**  
**Dana Gonzales, Ph.D.**  
**Tina Crook, Ph.D.**

#### **INSTRUCTOR**

**Verna Baker, MS, R.D.**  
**Lynn Christie, M.S., R.D.**  
**Amanda Wells Dawson, M.S., R.D.**

#### **NON UAMS GRADUATE FACULTY**

**Rosemary Rodibaugh, Ph.D., R.D. (UA  
Cooperative Extension Service)**

### **Degree Conferred: M.S. (NUTR)**

The Master of Science degree program in Clinical Nutrition is designed to prepare graduates to practice professionally at an advanced or specialized level. The program combines coursework at the University of Arkansas for Medical Sciences with clinical teaching at Arkansas Children's Hospital, Central Arkansas Veteran Healthcare System, University of Arkansas Cooperative Extension Service, and other cooperating institutions and agencies.

#### **Requirements for the Master of Science Degree.**

The degree program requires one of two options: a minimum of 36 semester hours including six hours of thesis; or 36 hours including 3 hours of research. Specific requirements for the thesis option include 19 semester hours of core courses, 8 hours of supportive courses and electives, a 3-hour practicum, and a master's thesis (6 semester hours), for a total of 36 semester hours. Specific requirements for the nonthesis option, include 19 semester hours of core courses, 11 hours of supportive courses and electives, a 3-hour clinical practicum, and a research project (3 semester hours). A written comprehensive examination and oral thesis defense will be required in accordance with Graduate School policy.

**Areas of Emphasis.** Advanced coursework is offered in geriatric nutrition, pediatric nutrition, community nutrition and nutrition in health promotion, wellness, and sports. Students select further study in one of these areas of emphasis including independent study, advanced clinical practicum, and thesis.

### **Prerequisites to Degree Program.**

In addition to the general requirements for admission to the Graduate School, applicants for the degree program are expected to have a baccalaureate degree in nutrition or a closely related field with a minimum of a 2.85 grade point average, a satisfactory score on the Graduate Record Examination, and approval of the graduate faculty in the Department of Dietetics and Nutrition.

## **CLINICAL NUTRITION (NUTR)**

- NUTR 5032**     **Assessment of Nutritional Status** Study of nutritional assessment systems and methodology including the latest technology in dietary, biochemical, anthropometric, and clinical evaluation. Emphasis placed on design of systems, interpretation of indices for all age groups in health and disease, and application of data in nutrition consultation. Prerequisites: Undergraduate courses in Biochemistry, Anatomy, Physiology, Nutrition, Food Science or equivalents.
- NUTR 5033**     **Advanced Clinical Nutrition** Integration of principles of biochemistry, physiology, pathology, anatomy, psychology, anthropology, epidemiology, nutrition and food science into therapeutic use of foods and nutrients in disease prevention and treatment through a case-oriented approach. Prerequisites include Biochemistry, Diet in Disease, Anatomy and Physiology, NUTR 5333 can be substituted for this course or consent.
- NUTR 5043**     **Diet and/or Cancer Prevention** focused on clinical and preclinical studies that address how dietary related factors, such as nutrients, bioactive food components and obesity, influence cancer development and cover major mechanisms by which dietary factors modify cancer risk. Prerequisites: A previous course in nutrition, biology, biochemistry, or physiology and consent.
- NUTR 5063**     **Medical Nutrition Therapy** Online course introducing nutrition as a medical specialty from the perspective of disease prevention and treatment including assessment, patient interviewing strategies, medical terminology, nutrition care plan techniques, and prevention strategies. Prerequisites: a course in nutrition and in organic biochemistry, physiology or equivalent. Consent.
- NUTR 509V**     **Independent Study in Clinical Nutrition (1-6)** This option may be used by students seeking to define a thesis topic or to pose a research question about a specific aspect of clinical nutrition. The student will prepare a written report following designated guidelines.
- NUTR 5103**     **Nutrition and Metabolism Macronutrients (I)** Reviews cell function, including acid-base, utilization of nutrients in metabolic processes, and roles of specific nutrients in human metabolism. Physiology and organ systems function as related to nutrition will also be addressed. Alterations in metabolic processes caused by specific diseases will be discussed.
- NUTR 5112**     **Nutrition Counseling (II, S)** provides an understanding of the methods, strategies, and evaluation techniques of nutrition and diet counseling. Learning styles, nutritional anthropology, and instructional technology are applied in the health care setting. Prerequisite: NUTR 5033: Advanced Clinical Nutrition or equivalent; and consent of faculty.

- NUTR 5122 Principles of Advanced Nutrition Support** Advanced study in the art and science of nutrition support explored through a comprehensive review of the literature; discussion of the biochemical, physiological, and medical aspects of nutrition support; and application of these principles in clinical practice through case study presentation. Students participate in literature analysis and case discussions. Prerequisites: NUTR 5033 Advanced Clinical Nutrition or equivalent; NUTR 5103 Nutrition and Metabolism or equivalent; NUTR 5032 Assessment of Nutritional Status or equivalent; and consent of faculty.
- NUTR 5143 Nutrition Research and Statistical Methods** A study of research designs, statistics, and data collection methods used in nutrition research. Emphasis on planning metabolic, epidemiological, educational, and clinical studies including food composition and nutritional assessment surveys with basic and advanced statistical applications. Prerequisite: Graduate level course in Statistics and consent of faculty.
- NUTR 5153 Nutrition and Metabolism Micronutrients (II)** This course reviews the roles of vitamins, minerals, and trace elements in metabolic processes, and their roles in human metabolism. Alterations in metabolic processes caused by specific vitamin deficiency diseases will be discussed. Metabolism of common drugs and drug-nutrient interactions will be reviewed. Prerequisite: NUTR 5103 or equivalent.
- NUTR 5161 Advanced Nutrition Seminar (I, II)** Graduate seminar of important current research in clinical nutrition to reflect content, application to clinical practice, and study parameters and design. Students will read original papers, write critiques, and make presentations for discussion.
- NUTR 5203 Geriatric Nutrition (I, S)** Examines the relationships between nutrition and physiologic aging. The impact of aging on nutritional requirements, effects of chronic and acute disease, effects of nutrition on the aging process, and nutrition programs for older adults are explored. Students will actively analyze and discuss research literature. Prerequisite: Graduate courses in metabolism, nutrition assessment, and advanced clinical nutrition. Consent of faculty.
- NUTR 5213 Pediatric Nutrition (II, S)** This course describes the relationship of growth and development to nutrient requirements, from infancy to adolescence. The assessment of feeding practices, food habits, and nutritional status in growth problems, health and diseases will be discussed. Nutritional interventions and therapies for specific conditions will be planned. Prerequisites: NUTR 5103, 5333, 5153, 5033 and consent of instructor.
- NUTR 5223 Nutrition in Health, Wellness and Sports (II, S)** This course describes the application of advanced principles of normal and preventive nutrition to health and fitness, physical performance, disease prevention, and health promotion in dietetic practice. It relates clinical research in exercise physiology to decision making in wellness and sports nutrition counseling. Prerequisites: NUTR 5103, 5133, 5153, 5033 and consent of instructor.
- NUTR 523V Advanced Clinical Practicum (II, S)** Based on individual needs and prior clinical experiences, the student may elect an area of advanced clinical nutrition practice for in-depth experiences after determining goals, objectives, and major experiences desired. Prerequisite: NUTR 5033, NUTR 5032, NUTR 5112, and NUTR 5203 or equivalent and consent of instructor.

- NUTR 5243**     **Community Nutrition** This advanced-level course will provide the student with a framework to approach, analyze, and work with the community nutrition problems. The needs of different populations and resources within the community will be discussed. This course will cover nutritional needs assessment, nutritional education and public policy. Pre-requisites include either NUTR 5103 or NUTR 5333 or Consent of faculty. Off-site activities will be necessary to fulfill requirements for this course.
- NUTR 5333**     **Advanced Clinical Dietetics** Integration of scientific principles of nutrition and food science into the use of foods and nutrients in disease prevention and treatment in accordance with clinical competencies for the entry-level dietitian. Co-requisite: Admission to Dietetic Internship. Consent of instructor.
- NUTR 551V**     **Special Topics in Clinical Nutrition** Advanced work in selected topics of current interest and investigation in clinical nutrition. Topics might include new research and guidelines in the use of nutrition or selected nutrients to prevent or treat a specific disease state such as diabetes, digestive diseases, osteoporosis, obesity, or cardiovascular diseases.
- NUTR 600V**     **Master's Thesis in Clinical Nutrition (1-6) (I, II, S)** Under supervision of graduate faculty, an original research study will be designed and conducted with written thesis following Graduate School guidelines. Prerequisite: Consent of faculty
- NUTR 601V**     **Clinical Nutrition Special Project (1-3, I, II, S)** Completion of a capstone nutrition research project under direction of faculty advisor and non-thesis project committee. Minimum of three hours required. Grade of "R" until at least three hours are completed and defended. Prerequisite: Completion of or concurrent enrollment in all core courses in Clinical Nutrition. Corequisite: Approved project advisor.
- NUTR 608V**     **Research in Nutrition (1-10) (I, II, S)** Students will participate in a research project under the supervision of a faculty member.

# ARKANSAS CONSORTIUM FOR THE PH.D. IN COMMUNICATION SCIENCES AND DISORDERS - CSDPHD

**Betholyn Gentry, Ph.D.**, CSDDPC Graduate Program Co-Director  
UALR, 2801 South University Avenue, Little Rock, Arkansas, 72204, 501-569-8913

**Susan Moss-Logan, Ph.D.**, CSDDPC Graduate Program Co-Director  
UCA, 201 Donaghey Ave., Conway, Arkansas, 72035, 501-450-3176

## CDDPC Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uca.edu/org/csddpc](http://www.uca.edu/org/csddpc)

### PROFESSORS

Betholyn F. Gentry, Ph.D., UAMS  
Thomas Guyette, Ph.D., UAMS  
Robert Logan, Ph.D., UCA  
John Lowe, Ph.D., UCA

### ASSOCIATE PROFESSORS

Donna Kelly, Ph.D., UALR  
Dee M. Lance, Ph.D., UCA  
Gary McCullough, Ph.D., UCA  
Susan Moss-Logan, Ph.D., UCA  
Laura Smith-Olinde, Ph.D., UAMS  
Jim Thurman, Ed.S., UCA  
Richard I. Zraick, Ph.D., UAMS  
Kim McCullough, Ph.D., UCA

### ASSISTANT PROFESSORS

Samuel Atcherson, Ph.D., UALR  
Brent Gregg, Ph.D., UCA  
Terri Hutton, M.F.A., UAMS  
Nannette Nicholson, Ph.D., UAMS  
Greg Robinson, Ph.D., UALR

### INSTRUCTORS

Jeff Adams, M.S., UCA  
Beth Eaton, M.A., UALR  
Patricia Highley, Au.D., UALR  
Stacey Mahurin, M.S., UALR  
Kathy McDaniel, M.S.E., UCA  
Beth McWeeny, M.S., UALR  
Linda Moore, M.S.E., UCA  
Sharon Ross, M.S., UCA  
Gail Weddington, Au.D., UAM

## Degree Conferred: Ph.D. (CSPHD)

**Prerequisite to Degree Program.** Applicants must first be admitted to the Graduate School by the Dean of the Graduate School, University of Arkansas for Medical Sciences, and then be approved by the CSDDPS faculty.

**Requirements for the Doctor of Philosophy Degree.** A minimum of 70 graduate hours are required for graduation. These 70 hours are distributed in the following areas: Statistics- 9 hours; Research Methods/Pre-Dissertation Research-9 hours; Special Topics-18 hours (12 in major area and 6 in secondary area); Professional Development/Pedagogy-10 hours (Teaching, Grant Writing and Clinical Supervision); Collateral Area-6 hours; and Dissertation-18 hours.

The Ph.D. will be awarded to those candidates who successfully complete all required course work (including any additional courses deemed necessary by the candidate's graduate committee) and the doctoral candidacy examination. Candidates must successfully present and defend their dissertation.

## Policies on Progression and Probation

The courses listed below are applicable to the Ph.D. in Communication Sciences and Disorders which is offered through a consortium of the University of Arkansas for Medical Sciences, University of Arkansas at Little Rock, and the University of Central Arkansas. The University of Arkansas for Medical Sciences is the host institution and custodian of the academic records for this program. Enrollment in courses for the

program may occur at any or all of the institutions. See the CSDPHD Director for specific registration information each semester. The Director of the consortium program will be responsible for submitting each student's grades for all courses from each of the campuses where the student has been enrolled, to the UAMS Graduate School's Registrar's Office. These grades will be used to compute semester and cumulative grade point averages.

The Arkansas Consortium for the Ph.D. in Communication Sciences and Disorders' Retention/Probation policy is as follows:

Students must maintain a minimum cumulative grade point average of 3.00 in order to remain in the program. A student whose cumulative grade point average falls below a 3.00 will be put on academic probation and will have one semester (10 semester credit hours) to increase his/her cumulative grade point average to the minimum of 3.00. If the student's grade point average is so low that it is not mathematically possible to increase his/her cumulative grade point average to the minimum of 3.00, he/she will be dismissed from the program. Additionally, a grade of "D" in any course is not considered acceptable, regardless of the student's cumulative grade point average. Any course for which a student receives a grade of "D" or below will need to be retaken.

- ASP 6003      **Advanced Research Methods**** Theory, principals and practices of research design in communication science and disorders. Emphases on methodology of collecting, analyzing and presenting qualitative and quantitative data. Topics will include: research questions, literature review, research design, data organization and manipulation, scientific writing, and the publication and presentation process. No pre-requisites (UALR-AUSP 8304; UCA-SPTH 7300)
- ASP 6013      **Doctoral Seminar in Hearing**** The exploration of research and practice related to hearing science and hearing disorders. Course reflects recent developments in the literature and interests of participants. Topics may include: the anatomical basis of hearing science, acoustics and instrumentation, psychoacoustics, physiological acoustics, evaluation of hearing, hearing conservation, amplification, and aural habilitation and rehabilitation. (UALR-AUSP 8301; UCA-SPTH 7310)
- ASP 6023      **Doctoral Seminar in Speech**** The exploration and evaluation of research, practice, and technology related to speech development and disorders. Course reflects recent developments in the literature and interests of participants. Topics may include: motor speech disorders, speech science, physiological and neurophysiological bases of speech production, voice, dysphagia, fluency, articulation, craniofacial anomalies, gerontology, AAC, multicultural issues. (UALR-AUSP 8302; UCA-SPTH 7330)
- ASP 6033      **Doctoral Seminar in Language**** The exploration and evaluation of current research, practice, and technology related to language development and disorders. Course reflects recent developments in the literature and specific interest of participants. Topics may include: developmental disorders, neurophysiological bases of language and communication, neurogenic cognitive-linguistic disorders, phonology, AAC, multicultural issues, gerontology. (UALR-AUSP 8303; UCA-SPTH 7320)
- ASP 604V      **Research Project**** This course covers skills necessary to complete a research project consisting of a research question, review of the literature, methodology, data collection, data analysis and written report. (UALR-AUSP 8131-8631; UCA-SPTH 7103-7603)
- ASP 6052      **Grant Writing Pedagogy**** This course covers strategies for identifying funding agencies appropriate for research and special programs. Techniques for writing grant proposals for both private and public funding will be emphasized. (UALR-AUSP 8205; UCA-SPTH 7210)

- ASP 6062**      **Supervision Pedagogy** Exploration of the art and science of clinical teaching, supervision of clinical services, management of clinical programs, and instruction in communication disorders. Specific emphases will target clinical problem solving, maximizing student and client feedback, supervisory conferencing, evaluating student and client performance, clinical scheduling/record keeping, and clinical and program efficacy. (UALR-AUSP 8206; UCA-SPTH 7220)
- ASP 6072**      **Teaching Pedagogy** Principles and practices of course development and teaching skills in communication sciences and disorders. Emphases on understanding and integrating course content, targeted levels of learning, specific objectives, instructional strategies, and assessment. Additional topics include: motivating students, attributes of good teaching, professional development in teaching, distance education, and team/interdisciplinary teaching. (UALR-AUSP 8207; UCA-SPTH 7320)
- ASP 6083**      **Multicultural Issues** This course will engage students in discussions of multicultural and linguistic variables that must be recognized and applied in teaching, research, and clinical supervision in the field of speech-language pathology and audiology. (UALR-AUSP 8343; UCA-SPTH 7321)
- ASP 6091**      **Grant Writing Internship** This course involves the development, completion, and submission of a grant proposal to a private or public funding agency. Pre-requisite: ASP 6052. (UALR-AUSP 8109; UCA-SPTH 7110)
- ASP 610V**      **Teaching Internship** This course provides doctoral students with supervised experience in academic instruction. (UALR-AUSP 8123-8223; UCA-SPTH 7101-7601)
- ASP 611V**      **Supervision Internship** This course provides doctoral students with supervised experience in clinical supervision/instruction. Pre-requisite: ASP 6062 (UALR-AUSP 8111-8211; UCA-SPTH 7102-7602)
- ASP 700V**      **Dissertation** Pre-requisites: Doctoral candidacy and consent of Instructor. (UALR-AUSP 9199-9999; UCA-SPTH 8150-8950)

## Communicative Disorders (ASP)

**Terri J. Hutton, M.F.S., • ASP (M.S.)** Graduate Program Director  
UALR, 2801 South University Avenue, Little Rock, Arkansas 72204, 501-569-3155

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

Betholyn F. Gentry, Ph.D.  
Thomas Guyette, Ph.D.  
Patricia K. Monoson, Ph.D. (Emeritus)  
James C. Montague, Ph.D. (Emeritus)  
Shirley J. Pine, Ph.D. (Emeritus)  
Maurice A. Weatherton, Ph.D. (Emeritus)

#### ASSOCIATE PROFESSOR

Donna Kelly, Ph.D.  
Nannette Nicholson, Ph. D.  
Laura Smith-Olinde, Ph.D.  
Richard I. Zraick, Ph.D.

#### ASSISTANT PROFESSORS

Samuel Atcherson, Ph.D.  
Terri J. Hutton, M.F.A.  
Gregory Robinson, Ph.D.  
Kathy Shapley, Ph.D.  
Michael E. Winston, Ph.D.

#### INSTRUCTORS

Rebecca Atcherson, Au.D.  
Beth B. Eaton, M.A.  
Patricia A. Highley, M.S.  
Stacey L. Mahurin, M.S.  
Beth McWeeney, M.S.  
Gail Weddington, Au.D.

A research project or thesis is required of each student earning a Master's degree. A student chooses a faculty thesis advisor who is interested and qualified to direct research in the area of the student's interest. Students enrolling in Independent Research are assigned to a faculty advisor.

### Degree Conferred: M.S. (ASP)

This is an urban-oriented, consortium program combining the clinical and research resources of the University of Arkansas for Medical Sciences with the academic resources of the University of Arkansas at Little Rock. Additional support for this program comes through other cooperating clinics and agencies within the Little Rock urban area. The program is accredited through the American Speech-Language-Hearing Association's (ASHA) Council for Academic Accreditation in speech-language pathology and is also accredited by ASHA as a continuing education sponsor.

**Prerequisites to Degree Program.** Applicants must first be approved for admission by the Graduate Admissions Committee of the Department of Audiology and Speech Pathology and then admitted to the Graduate School by the Dean of the Graduate School, University of Arkansas for Medical Sciences. Information about admissions can be directed to 501-569-3155.

**Requirements for the Master of Science Degree.** The program provides for a thesis or non-thesis option. A minimum of 49 graduate hours are required for graduation. The thesis option must be declared early in the program. All non-thesis students are required to participate in some aspect of research prior to graduation.

All students are required to successfully pass comprehensive examinations on speech-language pathology subject matter during their fifth semester of their graduate training.

A degree will not be awarded until the student has successfully completed all academic and supervised practicum requirements for the Certificate of Clinical Competence from the American Speech-Language-Hearing Association. This means that the undergraduate student having little or no undergraduate background in communicative disorders will be required to complete 30 hours of undergraduate pre-requisite coursework prior to admission to the graduate program.

## COMMUNICATIVE DISORDERS (ASP)

- ASP 5013**      **Research Methods in Communication Disorders** Introduction to research methodologies in audiology and speech language pathology. Includes prospectus development, library research, funding sources, data collection, analysis, and professional research, writing and editing in communicative disorders and/or speech sciences.
- ASP 5042**      **Augmentative and Alternative Communication** Information relative to theoretical issues, design, and organization of nonverbal communication systems, and considerations for choosing specific devices for particular clients. The systems considered are manual systems, graphic systems, electronic and mechanical systems and handmade communication boards.
- ASP 505V**      **Practicum** Applied, supervised practicum experiences for graduate student clinicians including evaluations and therapy in the functional and organic speech, language, and hearing disorders of human communication.
- ASP 5073**      **Advanced Anatomy and Physiology for Speech** Investigates the anatomy and physiology of speech and language. Topics will include respiration, phonation, articulation, neurological control of speech and language and embryological development of the speech structures.
- ASP 5093**      **Neurogenic Language Disorders** Assessment procedures and intervention techniques for acquired neurogenic language disorders in adults. Covers language disorders secondary to cerebrovascular accident, traumatic brain injury and dementia.
- ASP 5113**      **Language Assessment and Therapy** Acquisition of first-language competence in relationship to language behavior with attention to phonological, morphological, syntactical and semantic components of language. Language deviation with emphasis on symptoms, etiology, evaluation and therapy. Language testing and therapy are explored in the second half of the course. Prerequisite: A course devoted to normal speech and language development or consent of instructor.
- ASP 5122**      **Fluency Disorders** Procedures, theories and therapeutic techniques in the treatment of various types and degrees of stuttering and cluttering.
- ASP 513V**      **Topics in Speech-Language Pathology (1-3)** A seminar offered for special projects or topics related to procedures and instrumentation, theoretical foundations, assessment, clinical or rehabilitative speech-language pathology. May be repeated for additional credit not to exceed 9 hours.
- ASP 5133**      **Infant-Toddler Communication: Development-Assessment-Intervention** Investigates prelinguistic/early linguistic communication and feeding/swallowing development. Methods of multidisciplinary assessment and intervention for infants and toddlers (birth to five) with special needs and their families will be addressed. Current formal and informal assessment tools and techniques, current intervention strategies, enhancing the therapeutic process across environments, utilizing team collaboration and facilitating parent-infant interaction.

- ASP 5142 Sociolinguistics** The linguistic structure of language, the nature and forms of symbolic behavior. Human uses of symbols from various groups and socio-economic levels, particularly in communication.
- ASP 5152 Organization and Administration of Clinical Programs** Consideration of problems involved in the organization, administration and accrediting of school, community and university speech language and hearing programs.
- ASP 516V Independent Research (1-6)** Research or individual investigation for master's level graduate students. Credits earned may be applied toward meeting degree requirements if the program approves and if a letter grade is assigned.. Repeated registration is permitted; however, no more than 3 hrs credit can be applied toward the 47 hour requirement.
- ASP 5163 Auditory Based Intervention** Auditory- based speech/language intervention is based on a normal neurological developmental model aimed at maximizing the child's use of his/her residual hearing to communicate. This focus of this course is to provide information about current amplification and implant technology and to detail auditory-based principles, strategies and techniques used to facilitate spoken communication.
- ASP 5173 Counseling in Communication Disorders** A study of interpersonal communication problems encountered in conducting small group and one-to-one speech and language therapy. Students will use case studies and role-playing experiences to assist in identifying and improving therapy effectiveness.
- ASP 5183 Advanced Articulation Disorders** Advanced study of functional and organic articulation disorders, variables related to articulation, assessment and diagnosis of articulation disorders and therapeutic habilitation and rehabilitation procedures with clients exhibiting misarticulations. Prerequisite: A course in applied phonetics or consent of instructor.
- ASP 5192 Neurogenic Speech Disorders** A comprehensive study of classifications, characteristics and treatment of neurologically based speech disorders such as congenital and acquired dysarthrias. Emphasis is placed on etiology and neuropathology of different dysarthric syndromes, corresponding acoustical and perceptual characteristics and invasive versus noninvasive treatment approaches.
- ASP 520V Topics in Audiology (1-3)** Graduate seminar with emphasis on topics related to clinical or rehabilitative audiology. May be repeated for additional credit not to exceed 6 hours total.
- ASP 5213 Dysphagia** Examines normal oral, pharyngeal and esophageal swallowing function in adults and children, including neurology, physiology and the effects of aging. Swallowing disorders will be discussed, with an emphasis on oral and pharyngeal function. Various methods of evaluation will be considered, as well as current management and treatment options.
- ASP 5253 Voice Disorders** Assessment procedures and rehabilitative techniques for voice disorders in children and adults. Instrumental and behavioral approaches, as well as medical and/or surgical treatment approaches. A team approach to care will be emphasized.
- ASP 5262 Craniofacial Speech Disorders** Advanced study in theoretical issues, assessment, treatment and management of adults and children who have speech, language, and hearing disorders due to orofacial structural disorders.

- ASP 5273**      **Advanced Differential Diagnosis of Speech and Language Disorders** Comparative study in the differential diagnosis of speech and language disorders of children and adults; proficiency in the use and interpretation of standardized assessment procedures. Prerequisite: Undergraduate course in diagnostic methods or its equivalent.
- ASP 5282**      **Learning Disabilities** An introduction to the characteristics, definitions, etiologies assessment and therapeutic procedures in the treatment of children diagnosed with learning disabilities. Emphasis will be place on the scope of practice for speech-language pathologists and audiologists in the due process procedure for these children.
- ASP 5293**      **Multiculturalism and Communication Disorders** A framework for systematically analyzing cultural similarities and differences will be provided. This course will serve as a model to examine cultural differences, verbal and nonverbal, in the clinical setting.
- ASP 530V**      **Independent Study** Prerequisites: graduate standing and consent of instructor. Directed readings in audiology and/or speech/language pathology, individual discussion with a faculty member. (1-3 hours) May be repeated for up to 6 hours credit. On demand.
- ASP 5352**      **Communicating with Older Adults** An interdisciplinary course that will focus on the theory, art and science of successful communications with older adults and provide students an opportunity to learn skills that will optimize their communications with peers, older adults and caregivers through classroom exercises and clinical lab participation.
- ASP 600V**      **Thesis (1-6)** Thesis students must register for a total of six semester hours; one to six semester hours per semester. Prerequisite: ASP 5013 Introduction to Graduate Study.

# GENETIC COUNSELING (GENC)

**Bruce Haas, M.S.**, GENC Program Director  
UAMS, 4301 West Markham, Slot 836, Little Rock, AR 72205, 501-526-7700

## The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

### PROFESSOR

**G. Bradley Schaefer, M.D.**  
**Warren Sanger, Ph.D.**

### ASSISTANT PROFESSOR (continued)

**Elizabeth Conover, M.S.**  
**Bruce Haas, M.S.**

### ASSISTANT PROFESSOR

**Lori Williamson Dean, M.S.**

### INSTRUCTOR

**Noelle Agan, M.S.**  
**Becky Butler, M.S.S.W.**

## Degree Conferred: M.S

### Program Description

The Genetic Counseling program is housed in the College of Health Related Professions at the University of Arkansas for Medical Sciences. The curriculum is designed to emphasize the principles of human genetics, the applicability of related sciences to human medical genetics, the principles and practice of medical genetics, the psychosocial, social, ethical, and legal aspects of delivering genetic services, and the teaching skills and research methods needed to promote the use of genetic services. The program is fully accredited by the American Board of Genetic Counseling.

The didactic portion of a portion of the curriculum uses a variety of distance education methods. Interactive video and Web-Based Lectures are given both synchronously and asynchronously, depending on the material being presented. Students are required to attend classes at UAMS in Little Rock. The clinical portions of the curriculum takes place in a face-to face format, and may require students to travel limited distances.

Practicum experiences are an integral portion of this program. Clinical training provides students with first-hand experiences with families affected by a broad range of genetic diseases and birth defects. There is a sufficient number and variety of clinical experiences to ensure that all enrolled students receive adequate supervised genetic counseling experience and prepare them for individual certification eligibility with the American Board of Genetic Counseling.

### Admission Requirements

Students applying for admission to this graduate program must have earned an undergraduate degree (BS, BA, etc.) from an accredited college or university. Preferred degrees are in biology, genetics, chemistry, and/or psychology or related fields. At least one semester each of statistics, biochemistry, and genetics are required. A full year (two semesters) of biology, chemistry, and psychology is required. In addition, we recommend completion of a semester of abnormal psychology, a semester of human genetics, a semester of physiology, and a semester of embryology or developmental biology. Minimum grade point is 3.0 (on a 4.0 scale). Satisfactory scores on the Graduate Record Examination (GRE) verbal, analytical, and quantitative sections. In addition it is required that counseling experience (i.e. paid or volunteer experience on a crisis hotline or social services agency) be obtained. Experience in a clinical genetic counseling setting is also required. Essay requirement includes a personal statement on career goals and interest in the

field of medical genetics/genetic counseling. A curriculum vitae is required. Three letters of recommendation are also required.

### **Degree Requirements**

The program requires a minimum of 58 graduate hours. GPA of 3.0 must be maintained. Students may choose to complete a thesis (following the requirements of the Graduate School) or a non-thesis option, which requires students to complete an independent project that can be submitted for publication. Students must pass comprehensive examinations. They must complete all clinical requirements, as well as supplementary activities listed in course syllabi. A degree is awarded upon successful completion of all academic and practicum requirements for the University of Arkansas for Medical Sciences.

### **Genetic Counseling (GENC)**

- GENC 5002 Introduction to Molecular Genetics** Background in the principles of medical and molecular genetics, such as Mendelian inheritance patterns, and familiarizing the student with the genetic techniques and services now being provided in clinical medicine. The course will also assist students in developing the problem-solving skills required to extract and utilize genetic information from patients and families. Acceptance into the Genetic Counseling Program is the prerequisite.
- GENC 5013 Psychosocial Genetic Counseling** An overview of the psychological and sociological impact that genetic disease and birth defects have on affected individuals, families, and society at large. The theories of psychosocial counseling that represent the core of the profession will be explored. In addition, the students will examine their own beliefs and backgrounds, and learn how these may impact their ability to provide genetic counseling. Prerequisite for the course is acceptance into the Genetic Counseling Program.
- GENC 5023 Topics In Genetic Counseling I** An introduction to the profession of genetic counseling. Students will learn information necessary to functioning in a variety of settings. Teaching will include lectures, demonstrations, and special independent and group assignments. Topics include: history of the profession, obtaining accurate family histories, developing accurate pedigrees, multicultural sensitivity, and constructing an overall genetic counseling session.
- GENC 5032 Research, Writing, and Critical Analysis/Journal Club** An overview of the processes of developing research questions, methods, publications, and evaluations. The student will also be introduced to grant-writing and grant-review processes. In addition, critical analyses of scientific and lay articles will be performed by students through participation in a journal club. Projects may include grant writing, literature searches, and writing for publication.
- GENC 5042 Cytogenetics and Medical Genetics Review** Instruction in Mendelian Inheritance, atypical patterns of inheritance of human disease, pathogenesis of genetic conditions and birth defects, the importance of the field of genetics in clinical medicine, including the basics of genetic screening, testing, and treatment. In addition, the role of chromosomes in heredity and human disease will be discussed.
- GENC 5153 Counseling, Interviewing, and Family Theory** Exploration of the basic concepts of group and family therapy as foundation for the facilitation of genetic counseling management of clients' healthcare needs in a holistic, efficacious, and timely manner. A major emphasis in this course provides students, through practice, with the knowledge to intervene effectively with families who may be experiencing the stress of a genetic diagnosis.
- GENC 5162 Population Genetics** The basics of genetic epidemiology and population genetics, including interpretation of large-scale, population based genetic studies. The course will introduce into use, the important genetic concepts of probability theory, Hardy-Weinberg Equilibrium, segregation and linkage analysis, and the Bayesian theorem.

- GENC 5173 Embryology, Prenatal Diagnosis, and Teratogens** Prenatal genetic counseling techniques and prenatal diagnosis procedures will be introduced, discussed, and demonstrated. Observation in a prenatal diagnosis clinic will be required. Will also introduce the basic facts and concepts of normal and abnormal human development. Presentation of basic information on known and potential human teratogens. Students will become familiar with the major teratogen references and databases. Participation in state teratogen information services will be required.
- GENC 5182 Systems Disorders for Genetic Counselors** An overview of human congenital malformations and inherited disorders of all organ systems, which will include diagnostic criteria as well as treatment. The course will be presented by a variety of lecturers in multiple clinical specialties.
- GENC 5192 Dysmorphology and Common Syndromes** Information on the genetic, clinical, and diagnostic testing bases of a variety of genetic syndromes. Information on normal and abnormal human development, and the study of dysmorphology. Acceptance into the program is the prerequisite, as is successful completion of GENC 5002 and 5042.
- GENC 5232 Topics In Genetic Counseling II: Professional Issues** Instruction specific to the profession of genetic counseling. Topics include: awareness of available genetic services for appropriate patients including clinical, education, and psychosocial support, computer literacy with regard to important genetic databases, methods of genetic outreach in rural areas including telemedicine, and other professional issues of genetic counselors.
- GENC 5242 Cancer Genetics** The genetic basis of inherited cancer and cancer syndromes, with an overview of the development and treatment of these cancers. In addition, exploration of cancer genetics, patient education, and psychosocial adjustment to presymptomatic testing.
- GENC 5251 Ethics** Methods of ethical case analysis through lecture, demonstrations, and problem-based learning. Focus will be placed on cases and situations that genetic counselors will encounter in everyday employment and other professional areas
- GENC 6152/62 Thesis/Research Projects** Independent study for initiation, design, and completion of thesis study under the approval/guidance of the faculty advisory committee. For students who choose the non-thesis track, the special project course will enable them to complete independent projects or presentations that have been approved by the faculty advisory committee. Pre-requisites include acceptance into the program and approval of topic(s) by appropriate faculty.
- GENC 5262 Metabolic Genetics** Discussion of the recognized clinical disorders that are caused by inherited errors in specific human metabolic pathways, including hemoglobinopathies, disorders of energy transport and storage, and mitochondrial disease. Students will be able to recognize the symptoms of such conditions as well as be able to discuss testing and treatment of these disorders.
- GENC 5312 Public Health Genetics** Introduction to the concept of genetic disease as a public health concern. Introduction to a variety of health care delivery systems, financial and reimbursement issues, and review of genetic screening issues. Students will have the ability to participate in one of several large/state/regional/national registries, such as the Komen Breast Cancer Foundation, other state cancer registries, the Arkansas Center for Birth Defects Registry, and in a variety of genetic disease support groups.
- GENC 5322 Emerging Topics in Genetics** An overview of epigenetics, the genetics of the immune system and genetic bases of autoimmune disorders, such as diabetes and lupus, will be explored. A portion of this course will also be devoted to a new field of research (pharmacogenetics) involving treatment of disease with specific combinations of drug therapies based on patient genotypes. In addition, the emerging field of psychiatric genetics will be explored.

- GENC 5411**     **Genetics Laboratory Practicum** Provides the student with practical experience in institutional genetic and chemistry laboratories: the cytogenetics laboratory at UAMS/ADH, the maternal serum screening laboratory at UAMS, the newborn screening laboratory at ADH. Students in the other MAGEC states will have similar local experiences.
- GENC 5513**     **Genetics Clinical Practicum I** Provide students with practical experience performing genetic counseling for patients/families referred to a prenatal diagnosis program for a variety of reasons. These include advanced maternal age, abnormal maternal serum screening, abnormal ultrasound findings, teratogen exposures, chronic maternal disease, and infertility issues. Students will observe and counsel patients under the supervision of trained genetic counselors and maternal-fetal medicine specialists.
- GENC 5613**     **Genetics Clinical Practicum II** Provide the student with practical experience performing genetic counseling in pediatric genetics clinics for patients/families referred for a variety of reasons, including family history of inherited or genetic diseases/chromosomal abnormalities, abnormal newborn screening results, and evaluation for features of particular syndromes. Students will observe and provide counseling under trained genetic counselors, medical geneticists, and appropriate medical specialists.
- GENC 5713**     **Prenatal Diagnosis Practicum** Provide students with practical experience performing genetic counseling for patients/families referred to a prenatal diagnosis program for a variety of reasons. This includes advanced maternal age, abnormal maternal serum screening results, family histories of chromosomal or genetic disease, abnormal ultrasound findings, teratogen exposures, chronic maternal disease, and infertility issues. Students will observe and counsel patients under the supervision of trained genetic counselors and maternal-fetal medicine specialists.
- GENC 5613**     **Laboratory Practicum** Provide the student with practical experience in institutional chemistry and genetic laboratories: the cytogenetics laboratory at UAMS/ACH, the maternal serum screening laboratory at UAMS, the newborn screening laboratory at ADH. Students in the other Consortium states will have similar local experiences.
- GENC 5813**     **Genetics Clinical Practicum IV** Provide the student with practical experience in providing patients/ families with genetic counseling for a variety of cancer disorders and cancer syndromes. Students will observe/counsel these patients under the direct supervision of trained genetic counselors, oncologists, and medical geneticists.
- GENC 5513**     **Cancer Genetics Practicum** Provide the student with practical experience in providing patients/families with genetic counseling for a variety of cancer disorders and cancer syndromes. The student will observe and/or counsel these patients under the direct supervision of trained genetic counselors, oncologists, and medical geneticists.
- GENC 5913**     **Specialty Clinics Practicum** Provide the student with practical experience in providing patients and families with genetic counseling for a variety of genetic diseases in multidisciplinary specialty clinics, such as sickle cell disease clinic, hemophilia clinic, cystic fibrosis clinic, and Huntington's disease clinic.

## **HEALTH PROMOTION AND PREVENTION RESEARCH (HPPR)**

**Paul Greene, Ph.D.**, HPPR Graduate Program Director  
UAMS, 4301 West Markham, Slot 601, Little Rock, AR 72205, 501-526-6706

### **The Faculty**

**Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)**

#### **PROFESSORS**

**Warren Bickel, Ph.D.**  
**Carol Cornell, Ph.D.**  
**Paul Greene, Ph.D.**  
**James Raczynski, Ph.D.**  
**Delia Smith West, Ph.D.**

#### **ASSISTANT PROFESSORS**

**Karen H. Kim-Yearly**  
**Rebecca Krukowski, Ph.D.**  
**Jan Richter, Ed.D.**  
**Christine Sheffer, Ph.D.**

#### **ASSOCIATE PROFESSORS**

**LeaVonne Pulley, Ph.D.**  
**Katherine Stewart, Ph.D.**

### **PROGRAM DESCRIPTION**

The College of Public Health (COPH) at the University of Arkansas for Medical Sciences (UAMS) offers a Doctor of Philosophy (Ph.D.) in Health Promotion and Prevention Research (HPPR). The degree is awarded by the UAMS Graduate School in recognition of scholarly achievement evidenced by a period of successful advanced study, the satisfactory completion of prescribed examinations, and the defense of a dissertation addressing a significant issue relevant to social and behavioral sciences in public health.

The curriculum of the HPPR program provides extensive training in basic and applied research methodology that will allow public health scientists to serve as Principal Investigators responsible for developing an extramurally funded program of independent research. Integrated within the multidisciplinary environment of an academic health sciences center, the proposed PhD program is uniquely positioned to advance our understanding of interactions among biological, behavioral and cultural processes that are associated with the etiology and prevention of major chronic illnesses that constitute a significant public health challenge in Arkansas. An advanced understanding of these complex interactions will expand the current knowledge base and foster the development and evaluation of new health care strategies and public health initiatives that subsequently can be implemented to enhance the health and well-being of individuals and communities throughout the state of Arkansas. A strong emphasis on applied and community based research methods provides graduates with a solid foundation in the design and evaluation of public health service programs. This perspective will foster collaboration with public health practitioners in the development of programmatic research that is truly responsive to the health needs of Arkansas residents and makes optimal use of public health infrastructure in the state.

#### **Degree conferred**

Individual who complete the training program will be awarded a PhD in Health Promotion and Prevention Research. Graduates will be prepared for careers as academic research faculty in schools of public health, medicine, nursing, and other affiliated health sciences. Graduates also will be prepared to function as research scientists in public and private foundations as well as in government agencies. In these various settings graduates will be able to apply scientific methods as well as administrative skills in the development and implementation of interdisciplinary efforts intended to advance our understanding of a broad range of challenging public health problems. Scientists who have been awarded a PhD in Health Promotion and Prevention Research will demonstrate advanced skills in the following areas: applied behavioral analysis for population applications; qualitative and quantitative research methods; investigation of behavioral risk factors for health outcomes; design, application and evaluation of multidisciplinary

health behavior interventions; research methods for the promotion of health and prevention of diseases; implementation and evaluation of policy initiatives addressing health-relevant behavior in individuals, organizations, and communities. The degree program provides extensive mentored experience with research methodology relevant to the application of a social ecological model of behavior change in primary, secondary and tertiary prevention among rural, medically underserved and multicultural populations. Research experience focuses on methods and skills relevant to community-based participatory research, outcomes research, and translational research.

### **Prerequisites to Degree Program**

Individuals who have earned an MS or equivalent degree in a health-related field from a regionally accredited institution in the United States, or from a foreign institution with similar requirements for the MS degree, are eligible to apply for admission to the Doctoral Program in Health Promotion and Prevention Research. Master's-level coursework should address core public health sciences, an overview of behavioral theories and methods relevant to public health, and a basic foundation in research design and methods. Applicants' master's theses should address a scientific question relevant to the application of behavioral and public health sciences either through secondary analysis of an existing data set or by collecting and analyzing new data. Master's-level course work and research experience will be evaluated and approved prior to admission to the PhD program.

Students who have not earned an MS or equivalent degree may petition the Admissions Committee to consider an exception to this eligibility requirement. All applicants (with or without an MS or equivalent degree) must demonstrate basic core competencies in public health, behavioral science, research design, and statistical methods in order to be considered for admission. Competencies in these areas may be demonstrated through the award of an MS or equivalent degree in a health-related field, successful completion of relevant course work at a regionally accredited institution of higher education or documented practical experience demonstrating the application of relevant skills. Individuals determined by the Admissions Committee to have demonstrated strengths in multiple core competencies may be considered for admission.

Application. Any individual desiring admission to the Graduate School must submit a fully completed application form to the Graduate School Office.

Transcripts. It is the applicant's responsibility to request that one official copy of the applicant's academic record be sent directly to the Graduate School Office from EACH college or university that the applicant has previously attended. The academic record should include all courses, grades, credits attempted, and degree(s) earned. Official transcripts should show completion of at least one graduate-level course in each of four key areas: health behavior and education; biostatistics; epidemiology; research design. Courses must have been completed within the 5 years immediately preceding the requested semester of admission. Applicants who have not completed these courses, but whose applications show exceptional potential for success, may be conditionally admitted to the PhD program, but will be required to complete the courses through available COPH course offerings with grades of "B" or better before registering for core required courses in the PhD program.

A minimum cumulative grade-point average of 2.70 (A=4.00) or better on all undergraduate and graduate coursework attempted at a regionally accredited institution of higher education is required. Should an applicant fail to meet this requirement, the program may petition on behalf of the applicant the Dean of the Graduate School to consider an exception to this requirement.

Masters Thesis. All applicants must submit a copy of their masters thesis or a written report demonstrating a comparable level of research experience and expertise that has been prepared in a manner consistent with publication in a peer-reviewed journal. The thesis or research report will be reviewed by the Admissions Committee to evaluate the relevance and quality of the applicant's research experience. The review will specifically consider: relevance and adequacy of literature review; significance and specificity of a well defined hypothesis or research question; appropriate and effective application of experimental methods; selection and description of appropriate intervention and assessment methods; description and application

of an appropriate data analysis plan; presentation and interpretation of results; discussion and integration of results within the public health literature.

Graduate Record Examination. A combined score of 1200 on the Graduate Record Examination (GRE) is required. The GRE must have been taken within five years immediately preceding the requested semester of admission. Programs may petition the Dean of the Graduate School, on behalf of the applicant, to consider an exception to this requirement.

Supplemental Materials. Applicants also must submit a curriculum vitae or resume, a personal statement of interest (500-700 words), and four (4) letters of recommendation from persons who may be contacted for academic and professional references.

#### Requirements for Admission of International Applicants.

1. All international applicants, including resident and non-resident aliens, whose native language is not English and who do not have a bachelor's or master's degree from a regionally accredited U.S. institution, are required to achieve a minimum score of 550 on the paper based written Test of English as a Foreign Language (TOEFL). A minimum score of 213 is required on the computer-based version of the examination. (Programs have the option of setting higher score requirements.) The test must be taken within the two years immediately preceding the requested semester of admission. Programs may petition the Dean of the Graduate School, on behalf of the applicant, to consider an exception to this requirement based on the program's interaction with the student.

2. All international applicants are required to take the Graduate Record Examination (GRE). Programs have the option to petition the Dean of the Graduate School on behalf of the applicant to substitute other official test scores on a case by case basis.

3. All international applicants who are in the U.S. in a non-resident alien status must have documentation of an appropriate status with the U.S. Citizenship and Immigration Services (USCIS). Applicants who are currently out of status with the U.S. Citizenship and Immigration Services (USCIS) will have no action taken on their application.

4. Students who are not U.S. Citizens must have on file at all times in the Graduate School Office current documentation of an appropriate status with the U. S. Citizenship and Immigration Services (USCIS). Individuals who are out of status with the I.N.S. will be denied initial enrollment, and individuals who become out of status during a period of enrollment will be denied future enrollment.

The PhD Admissions Committee will consider the sum total of the applicant's work, educational experience, research experience, recommendations, and other application data and will not allow a single factor to outweigh others in making recommendations for admission.

#### **Degree Requirements**

The PhD Program will require a minimum of 66 semester hours and can be completed within a three-year period of full-time study. All students (including those admitted on a conditional basis pending completion of pre-requisite coursework) must complete their full program of study within seven years after passing a doctoral candidacy exam, and must follow the published policies and procedures of the UAMS Graduate School. Students enrolled in the PhD program must complete: 9 semester hours of coursework in Behavioral Science; 9 semester hours in Community Science; 6 semester hours in Quantitative Research Methods; 6 semester hours in Qualitative Research Methods. Students also are required to take an additional 9 semester hours of elective coursework that may be chosen from any of the content areas. In order to develop research skills required to function as an independent investigator, students must complete 27 semester hours of Applied Research Methods. The 21 hours of didactic electives and 12 hours of mentored research experience identified in the degree plan will establish a conceptual and practical foundation for the development of dissertation research. These 33 elective semester hours in conjunction with 12 or more semester hours of dissertation research comprise for each student a uniquely defined area

of specialization in either Behavioral Science or Community Science. A Doctoral Advisory Committee will be appointed during the first year of graduate study to assist the student in developing an individualized degree plan that will best serve his or her professional and academic goals. Approval of the initial dissertation proposal and of the final written dissertation and oral defense will be determined by this committee. The dissertation must address a scientific question relevant to the application of behavioral and public health sciences either through secondary analysis of an existing data set or by collecting and analyzing new data. Students who complete all coursework and successfully propose and defend a dissertation are awarded a PhD in Health Promotion and Prevention Research.

Doctor of Philosophy Candidacy Exam. Candidates for the Doctor of Philosophy degree must pass a candidacy examination administered after approximately one year of study in the doctoral program. Results of the examination will be submitted to the Graduate School Office immediately following the examination. After the student has passed the Doctor of Philosophy Candidacy Examination, the student must register for at least one credit hour of dissertation for each semester and one credit hour of dissertation for each summer session until the degree is awarded. Registration for a minimum of eighteen semester credit hours of dissertation is required of doctoral degree candidates.

Time Frame for Completion of Degree. After passing the candidacy examination the degree must be completed within seven consecutive calendar years.

Grade-Point Average to Receive a Degree. In order to receive a degree, a candidate must present a minimum cumulative grade-point average of 3.0 on all graduate courses required for the degree. Failing to earn such an average on the minimum number of hours, the student is permitted to present up to six additional hours of graduate credit in order to accumulate a grade-point average of 3.0; but in no case shall a student receive a degree who is obliged to offer more than six additional hours of credit beyond the minimum. In the computation of grade point, all courses pursued at this institution for graduate credit that are part of the degree program (including any repeated courses) and the thesis (if offered) shall be considered. A student who repeats a course in an endeavor to raise his grade must count the repetition toward the maximum of six additional hours.

Doctoral Advisory Committee. A Doctoral Advisory Committee must be appointed within the first year of graduate study. This committee will assist the student in developing a degree plan that will integrate didactic electives, mentored research experiences, and dissertation research reflecting an area of specialization in either Behavioral Science or Community Science. The committee must review and approve the degree plan, the initial dissertation proposal, and the final written dissertation and oral defense.

At the time the committee is appointed, notification of the committee membership must be forwarded to the Graduate School Office. The committee will include no fewer than five (5) UAMS Graduate Faculty members, one of whom will be designated as chair to the Graduate School Office. Three members of the committee must hold primary faculty appointments in the COPH. With a program's submission of an outside member form and CV to the Graduate School office, and approval of the UAMS Graduate Council, one person who is not a UAMS Graduate Faculty member may serve as a required committee member but not as chair.

Approval of Dissertation. A public defense is required along with approval by 80% of the Doctoral Advisory Committee for acceptance of the dissertation.

## **HEALTH PROMOTION AND PREVENTION RESEARCH (HPPR)**

**HPPR 5773**     **Survey Research Methods** This course will provide students with a practical overview of survey research methods. Topics to be covered include questionnaire and interview design; tailoring instruments for specific settings; populations; and methods of administration; reliability and validity; scales and indices; sampling methods; sampling bias, and maximizing response rates. Prerequisites: Doctoral student standing

- HPPR 5903** **Built Environment and Public Health** This course focuses the current and historical evidence for the built environment-public health link in major areas of public health (e.g., cancer, obesity, tobacco). Students will utilize tools to assess the local built environment (e.g., restaurants, playgrounds, workplaces) and will prepare students to begin thinking about intervention strategies. There are no prerequisites or corequisites.
- HPPR 900V** **Independent Study** This course provides in-depth consideration of specialized subjects not covered in general courses. Substantive content and methodological issues addressed will reflect the expertise of the instructor and will complement basic course work and scientific interests of the student. Prerequisites: Learning objectives and strategies defined prior to registration; Permission of instructor.
- HPPR 9023** **Advanced Health Behavior Theory** This course will review major theories of behavior change and explore complex relationships between socio-demographic factors and theory constructs. Students will gain substantial experience in designing behavioral theory-based public health interventions. Prerequisites: Doctoral student standing and completion of one graduate-level course in health behavior or health education.
- HPPR 9053** **Applied Behavioral Research Methods** This course addresses behavioral research: the role of theory, problem definition, and hypothesis generation; research design; measurement of health behaviors; and critical review and interpretation of published research. Prerequisites: Doctoral student standing in the UAMS College of Public Health, and completion of HPPR 9023, or by permission of instructor.
- HPPR 9103** **Program Design and Evaluation 1** This course introduces an interdisciplinary approach to public health program design and evaluation incorporating the community-based participatory model. Students will examine qualitative and quantitative data relevant to the design, implementation and evaluation of interventions tailored for specific populations. Prerequisites: HPPR 9023, HPPR 9053, one doctoral level course in statistics.
- HPPR 9113** **Program Design and Evaluation 2** This course provides practical experience in program design and evaluation, incorporating the community-based participatory model. Students will apply material learned in HPPR 9103 to develop an intervention and evaluation plan in collaboration with a community. Prerequisites: HPPR 9023, HPPR 9053, HPPR 9103, one doctoral level course in statistics.
- HPPR 9123** **Public Health Funding and Grantsmanship** This course provides information and cultivates skills required to develop grant applications supporting public health programs, and prevention research. Relevant topics include: funding agencies and mechanisms; justifying proposals; rigorous assessment and intervention methods; and working on a research team. Prerequisites: Doctoral student standing; HPPR 9053, HPPR 9103; HPPR 9913.
- HPPR 9253** **Faith-Based Health Promotion** This course will review the literature on religion and health, and faith-based health promotion. Students will explore the complex relationships between religion and health, and apply the literature on religion and health into the design of faith-based public health interventions. Students will gain experience in building upon the current religion and health literature, and in the design of public health interventions that are appropriate for a faith-based setting.

- HPPR 9343** **Qualitative Methods** This course introduces qualitative modes of social and behavioral research within the context of public health programs and research. Research methods and data sources examined include action research, case studies, grounded theory, observation, interviews, focus groups, ethnography and content analysis. The use of qualitative methods to inform public health programs and the role of constituents as partners in the research process are examined. Prerequisites: Doctoral student standing.
- HPPR 9353** **Social and Cultural Determinants of Health** This course provides the student with cross cultural examples and information from the field of medical anthropology to understand ways to achieve the appropriate application and practice of culturally competent behaviors as they relate to health care and public health programs and research. Prerequisites: Doctoral student standing.
- HPPR 9383** **Health Communication** This course provides students with an in-depth exposure to current theory, practice and research in health communication, with an emphasis on designing, implementing and evaluating mass media and community-based health campaigns. Topics covered include social marketing, media advocacy, entertainment education and participatory learning in addition to traditional social-psychological and communication theory-based approaches to risk reduction/health enhancing communication.
- HPPR 9413** **Tobacco Use and Cessation** This course provides in-depth exposure to research and theory addressing the determinants and consequences of tobacco use. Practical application of techniques to decrease tobacco use and reduce tobacco-related morbidity and mortality also is addressed. Prerequisites: Doctoral student standing, HPPR 9023, BIOM 5013 or its equivalent.
- HPPR 9423** **Public Health Informatics and eHealth Programs** This course focuses on theories and practices involved in the development and implementation of public health informatics and eHealth programs to promote healthy behaviors within communities. The course will prepare graduates to lead multidisciplinary research and development teams involved in eHealth programs. Prerequisite: Doctoral student standing
- HPPR 9633** **Understanding Tobacco Use and Obesity** The course focuses on two primary risk factors associated with preventable mortality, tobacco use and obesity, addressing scope of the problem, causes and correlates and theory-based health behavior approaches to prevention and treatment. Prerequisites: Must have doctoral student standing in the Ph.D. program in Health Promotion and Prevention Research, and have successfully completed at least one graduate-level course in health behavior/health education (e.g. HPPR 9023) to enroll in this course or by instructor permission (this requires meeting with at least one instructor in person).
- HPPR 980V** **Dissertation Research** The doctoral dissertation is a culminating experience that requires the student to synthesize and integrate knowledge and apply theory and principles of health promotion and prevention research. A written dissertation proposal must be presented and defended at a meeting of the doctoral Advisory Committee. The completed dissertation must also be presented and successfully defended during a meeting of the doctoral advisory Committee. The final written must be submitted in accordance with the guidelines contained in the manual regulations for preparing Theses and Dissertations, which is available in the UAMS Bookstore and on the UAMS Graduate School website. Prerequisite: Doctoral student standing and permission of instructor.

## HEALTH SYSTEMS RESEARCH (HSRE)

**Tyrone F. Borders, Ph.D.**, HSR Graduate Program Director  
UAMS, 4301 West Markham, Slot 601, Little Rock, AR 72205, 501-686-6641

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

**John Baker, Ph.D.**  
**Brenda Booth, Ph.D.**  
**Tyrone Borders, Ph.D.**  
**Paul Halverson, Dr.P.H.**  
**Bradley Martin, Ph.D.**  
**Glen Mays, Ph.D.**  
**Andreas Muller, Ph.D.**  
**Greer Sullivan, M.D.**  
**John Tilford, Ph.D.**  
**John Wayne, Ph.D.**

#### ASSOCIATE PROFESSORS

**Geoffrey Curran, Ph.D.**  
**Theresa Prewitt, Dr.P.H.**  
**Kevin Ryan, J.D.**  
**Mary K. Stewart, M.D.**

#### ASSISTANT PROFESSOR

**Creshelle Nash, M.D.**

### PROGRAM DESCRIPTION

The Department of Health Policy and Management at the Fay W. Boozman College of Public Health offers a program of instruction leading to the Doctor of Philosophy (Ph.D.) degree in Health Systems Research. The program provides students with the theoretical and methodological foundations necessary to conduct creative and independent research on health systems, with the ultimate goal of identifying pathways to improved health system performance through evidence-based policy and management. The curriculum involves intensive and focused study in the theoretical perspectives and methodological strategies relevant to research on the organization, financing, and delivery of health services, including issues of quality, accessibility, efficiency, and equity within systems of care. Students develop scholarly expertise in these areas of study, advanced skills in quantitative research methods, confidence in their teaching, and a high standard of scientific integrity and professionalism. Job opportunities exist in university-based and independent health services research centers, health policy institutes, foundations and philanthropic organizations, consulting firms, and professional and advocacy associations working at state and national levels.

The Ph.D. Program is designed for full-time study and requires a minimum of 70 semester hours of study, which can be completed within a 3-4 year period. Students spend their first two years in full-time residential study at UAMS completing coursework in five core areas: (1) nine credit hours of coursework in health system theory and applications; (2) 13 credit hours of course work in quantitative research methods; (3) 15 credit hours of course work in a disciplinary area of concentration; (4) six credit hours of course work scholarship skills (grantsmanship and peer review, and instructional methods); and (5) nine credit hours of directed research conducted in conjunction with faculty in the Ph.D. program. After completing this coursework and passing a doctoral candidate examination, students focus on the development, conduct, and defense of their dissertation research.

**Degree conferred:** Ph.D. in Health Systems Research

**Areas of Concentration:** The program requires students to select one of two possible disciplinary areas in which to pursue concentrated study: (1) health economics; or (2) quality and health outcomes research. The health economics concentration allows students to master the body of theory and methods for studying the economic behavior of health care providers, insurers, and consumers and for evaluating the economic

impact of health policies and health care interventions. The concentration in quality and health outcomes research allows students to develop expertise in the theory and methods for evaluating quality of care and analyzing the outcomes that result from health services and interventions, including disparities in health care and health outcomes. .

Additionally, students are required to select a substantive research or policy area in which to focus their studies. These substantive areas are defined principally by areas of expertise held by members of the program faculty, and include health insurance, access to care, long-term care, aging, rural health care, nutrition policy, health disparities, community-based public health, public health policy and law, child health, and mental health. Students gain experience in their chosen substantive area primarily through three semester-long rotations (nine hours) of directed research study with program faculty. A student's chosen disciplinary concentration and substantive area will combine to form a coherent theoretical, institutional, and methodological knowledge base that the student will use to pursue dissertation research.

**Prerequisites to the Degree Program:** Students must have received an M.P.H. or related graduate degree (e.g. M.P.A., M.B.A., M.D., J.D.) prior to entry into the proposed program, along with some relevant experience in health policy or health services. Students will be required to describe and substantiate their areas of research and policy interest prior to being admitted to the program in order to ensure a close match between student interests and faculty expertise. Additionally, applicants must receive a combined score of at least 1200 on the Graduate Record Examination (GRE) taken within five years immediately before the requested semester of admission. Any individual desiring admission to the Graduate School must submit a fully completed application package to the Graduate School Office, including all undergraduate and graduate transcripts, curriculum vitae or resume, personal statement of interest, and four (4) letters of recommendation. Additional application requirements exist for international applicants.

### **Application Materials**

Applicants are admitted to the PhD Program each Fall semester. Applications are due by the first Monday in February prior to the desired semester of admission. Applications received after this date will be considered on a space-available base only. All application materials must be submitted to the UAMS Graduate School. Please contact the UAMS Graduate School at 501.686.5454 or visit their website at <http://www.uams.edu/gradschool/> with any questions regarding the application process, requirements and fees.

Any individual desiring admission to the Ph.D. Program in Health Systems Research (HSR) must ensure that the following materials are sent to the UAMS Graduate School Office:

1. A fully completed application form for the UAMS Graduate School.
2. One official copy of the applicant's academic record sent directly to the Graduate School Office from each college or university that the applicant has previously attended. The academic record should include all courses, grades, credits attempted, and degree(s) earned. A minimum cumulative grade-point average of 2.85 (A=4.00) or better on all undergraduate and graduate coursework attempted at a regionally accredited institution of higher education is required for admission. Should an applicant fail to meet this requirement, the PhD Program may petition on behalf of the applicant the Dean of the Graduate School to consider an exception to this requirement.
3. Scores from the Graduate Record Examination (GRE) taken within five years immediately preceding the requested semester of admission. A combined score of 1200 (verbal + quantitative) on the Graduate Record Examination (GRE) is required. The PhD Program may petition the Dean of the UAMS Graduate School, on behalf of the applicant, to consider an exception to this requirement. In light of the program's emphasis on quantitative research methods, considerable emphasis is placed on the GRE quantitative score.
4. A curriculum vitae or resume

5. A personal statement (500-700 words) describing and substantiating the applicant's areas of research and policy interest
6. Masters Thesis. All applicants must submit a copy of their masters thesis or a written report demonstrating a comparable level of research experience and expertise that has been prepared in a manner consistent with publication in a peer –reviewed journal. The thesis or research report will be reviewed by the Admissions Committee to evaluate the relevance and quality of the applicant's research experience. The review will specifically consider: relevance and adequacy of literature review; significance and specificity of a well defined hypothesis or research question; appropriate and effective application of research design and analytic methods; appropriate presentation and interpretation of results; and discussion of the applicability of results to clinical practice, public health practice, health policy, or health care management.
7. Four (4) letters of recommendation from persons who may be contacted for academic and professional references.

The following additional application materials and criteria will apply to international applicants:

1. All international applicants, including resident and non-resident aliens, whose native language is not English and who do not have a bachelor's or master's degree from a regionally accredited U.S. institution, are required to take the Test of English as a Foreign Language (TOEFL) within two years immediately preceding the requested semester of admission and submit their score as part of the application materials. Applicants must achieve a minimum score of 550 on the paper-based written test or a minimum score of 213 on the computer-based version of the examination. The program may petition the Dean of the UAMS Graduate School, on behalf of the applicant, to consider an exception to this requirement based on the program's interaction with the student.
2. All international applicants are required to take the Graduate Record Examination (GRE) taken within five years immediately preceding the requested semester of admission. The program has the option to petition the Dean of the Graduate School on behalf of the applicant to substitute other official test scores on a case by case basis.
3. All international applicants who are in the U.S. in a non-resident alien status must have documentation of an appropriate status with the U.S. Citizenship and Immigration Services (USCIS). Applicants who are currently out of status with the U.S. Citizenship and Immigration Services (USCIS) will have no action taken on their application.
4. Students who are not U.S. Citizens must have on file at all times in the Graduate School Office current documentation of an appropriate status with the U. S. Citizenship and Immigration Services (USCIS). Individuals who are out of status with the I.N.S. will be denied initial enrollment, and individuals who become out of status during a period of enrollment will be denied future enrollment.

The program is committed to ensuring the diversity of the doctoral student population. Minority candidates, including African Americans, Native Americans, and Hispanic Americans, are especially encouraged to apply.

#### **Requirements for the Degree Program:**

**Grade-Point Average.** In order to progress to the doctoral candidate examination, students must present a minimum cumulative grade-point average of 3.0 on all graduate courses required for the degree. Failing to earn such an average on the minimum number of hours, the student is permitted to present up to six additional hours of graduate credit in order to accumulate a grade-point average of 3.0.

**Candidacy Examination.** Students successfully completing the coursework and achieving the minimum grade-point average are required to pass a written doctoral candidate examination demonstrating mastery of all five core areas of coursework before progressing to dissertation work. Students must receive a passing grade on the examination in order to become a Ph.D. candidate.

**Dissertation Research.** Ph.D. candidates are required to complete a minimum of 18 hours of dissertation research in conjunction with a doctoral advisory committee of faculty. As the first step in the dissertation research process, candidates must develop a written proposal of their dissertation research and successfully defend the proposal during an oral presentation to the doctoral advisory committee. Once the proposal has been accepted by the committee, candidates must complete the research as proposed, develop a written monograph of their completed dissertation research, and successfully defend the research during a public, oral presentation to the doctoral advisory committee and other interested parties. The dissertation must represent valid, independent research conducted by the candidate that makes a significant contribution to health policy, health system management and practice, and/or health system research methodology. The dissertation research may include analysis of existing, secondary data and/or analysis of primary data collected by the candidate.

## HEALTH SYSTEMS RESEARCH (HSRE)

- HSRE 9011**     **Mathematics and statistics primer** Provides an overview of fundamental mathematical and statistical concepts used in health systems research including linear and matrix algebra, differential equations methods, optimization methods, and probability theory. Prerequisites: Doctoral student status.
- HSRE 9013**     **Instruction and teaching practicum** This course includes a review of instructional concepts and methods for graduate education and a teaching practicum that will involve significant responsibilities in course design, instruction, and evaluation for an existing MPH, MHSA, or DrPH graduate course taught in the COPH. Prerequisites: Doctoral student status.
- HSRE 9103**     **Health Systems Research Seminar** This two-semester course sequence reviews major advancements in the theories, methods, and applications of health services research to studies of health systems. Historical and contemporary studies of the organization, financing, and delivery of health services will be examined. Prerequisites: Doctoral student status.
- HSRE 9113**     **Advanced Health Policy and Management** Examines the development, implementation, and impact of public policies and health management strategies on population health. Includes policy and management theories as well as policy analysis and decision analysis methods. Prerequisites: Doctoral student status or permission of the instructor.
- HSRE 9303**     **Applied Research Methods Using Retrospective Data (3)** This course will outfit students with the skills necessary to analyze and conduct studies using retrospective health care data with a focus on large administrative claims data such as Medicaid and private payer insurance claims. Students will use SAS to analyze actual health care data. Instruction on study design, statistical techniques, and data integrity issues specific to observational studies using these data sources will be offered.
- HSRE 9313**     **Advanced Methods in Health Services Research** Provides an overview of study design and methods for health services research (HSRE) applied to health policy and public health problems. Emphasis given to non-experimental and quasi-experimental designs most often employed in health policy and services research, along with regression and maximum likelihood models. Prerequisites: HSRE 9011 and HSRE 9303
- HSRE 9323**     **Advanced Econometric Methods and Special Topics** Examines advanced econometric methods used in health systems research, including instrumental variables analysis, propensity score methods, longitudinal and panel data analysis methods, and duration models. Prerequisites: HSRE 9313

- HSRE 9333** **Survey Research Methods** Provides a practical overview of survey research methods. Topics covered include questionnaire and interview design, tailoring instruments for specific settings, assessing reliability and validity, construction of scales and indices, sampling methods, assessing sampling bias, and maximizing response rates.
- HSRE 9343** **Qualitative Research Methods** Examines theories, concepts, and methods of qualitative research as they apply to health research. Topics covered include qualitative research design, respondent selection, key informant methods, focus group methods, direct observation methods, document review and text analysis, and content coding and analysis methods. Prerequisites: Doctoral student status.
- HSRE 9503** **Grantsmanship and Funding** Examines information and skills required to develop competitive grant applications designed to support public health programs and prevention-oriented research. Topics addressed include selecting appropriate funding agencies, justifying proposed projects, developing rigorous assessment and intervention methods, and effective project management.
- HSRE 9603** **Introduction to Health Care Quality** Examines critical issues and processed for the evaluation and management of quality in health care delivery systems. Includes issues related to quality of care in community and clinical settings, customer service definitions and quality improvement in health care organizations. Prerequisites: Doctoral student status or permission of the instructor.
- HSRE 9613** **Quality and Outcomes Research** Examines conceptual models, methods, and dimensions of quality of care (QOC) research. Students will analyze the history and rationale of QOC assessment and methodological issues in measuring QOC in research. Prerequisites: Doctoral student status or permission of the instructor, HSRE 9303 and HSRE 9603.
- HSRE 9623** **Performance measurement and incentives** Examines the theoretical constructs and empirical methods currently used to assess, profile, and compare the performance of health professionals, institutions, and health systems. Measurement and incentive systems at national, state, and community levels will be analyzed. Prerequisites: HSRE 9603 and HSRE 9303.
- HSRE 9633** **Research on Consumer Satisfaction** Examines the design and implementation of consumer-oriented health systems research. Students will use consumer-reported measures of satisfaction, trust, and experiences with care to evaluate the use, costs, quality, accessibility, delivery, organization, financing, and outcomes of health systems. Prerequisites: HSRE 9603 and HSRE 9303
- HSRE 9643** **Methods in Health Disparities Research** Examines theory and research on how social, economic, and health system characteristics interact in contributing to racial/ethnic, socioeconomic and gender disparities in health and health care, and covers research methods for investigating the causes and consequences of disparities. Prerequisites: HSRE 9011 and HSRE 9601
- HSRE 9653** **Implementation of Change in Clinical Practice Settings.** Examines the theoretical frameworks relevant for studying diffusion of innovations and implementation of change in clinical practice settings, assesses the empirical evidence on strategies for adopting and implementing change, and considers methods for evaluating change processes.
- HSRE 9703** **Introduction to Health Economics** Provides an overview of economic theory applied to health care problems. Topics include competitive markets and health care, health insurance, health care demand, health production, physician agency, and the role of government in health care. Prerequisites: Doctoral student status or permission of the instructor.

- HSRE 9713**     **Advanced Microeconomic Theory** Examines key concepts of microeconomic theory, including consumer and producer theory, competitive markets, market power, information and contracts. Students develop formal models of behavior based on these concepts and apply them to relevant health policy issues. Prerequisites: HSRE 9011 and HSRE 9703.
- HSRE 9723**     **Advanced Health Economics I: Demand** Examines theory and advanced methods for modeling the demand for health, health care, health insurance, and public health activities. Prerequisites: HSRE 9713
- HSRE 9743**     **Pharmacoeconomics and Health Technology Assessment (3)** The purpose of this course is to provide students with the skills to design, conduct, analyze and rate investigations that assess the value or outcomes of health care technologies with a focus on pharmacy related products and services. The course will also integrate the theoretical prefaces to health care technology as well as provide real world applications using decision modeling software to conduct cost effectiveness and other related studies.
- HSRE 9753**     **Advanced Health Economics II** Provides an advanced examination of the supply side of health economics, including theory and research involving the production and distribution of health services and related products and technologies. Prerequisites: HSRE 9713 and HSRE 9723.
- HSRE 980V**     **Health Systems Directed Research** Practical research experience involving working on a research project under the supervision of a program faculty member with significant experience in health services and policy research. Students will complete three semester-long rotations (nine hours) of study in one or two substantive areas of policy of research. Prerequisites: Doctoral student status.
- HSRE 990V**     **Health Systems Dissertation Research** Independent research on a health system topic led by the doctoral candidate and guided by the approved dissertation committee. Students will complete at least 18 hours of dissertation research including research proposal development and conduct and defense of research. Prerequisites: Doctoral student status.

## INTERDISCIPLINARY BIOMEDICAL SCIENCES (IBSD)

**William D. Wessinger, Ph.D.**, IBS Graduate Program Director  
UAMS, 4301 West Markham Street, #611, Little Rock, AR 72205, 501-686-5514

### The Faculty

Research interests of the Interdisciplinary Biomedical Sciences (IBS) graduate faculty may be viewed through the program link at the Graduate School website, <http://www.uams.edu/gradschool>. A listing of IBS Interdisciplinary Tracks and associated faculty can be found at the IBS Graduate Program website, <http://www.uams.edu/ibs/tracks>.

All graduate faculty members are eligible to serve as major graduate advisors, or as contributing members of graduate committees, after establishing an affiliation with one or more of the IBS tracks. The following is a list of Graduate Faculty members whose primary appointment to the Graduate Faculty was sponsored by IBS.

#### PROFESSORS

Sameh Abul-Ezz, MBCh.B., Dr. P.H.  
William T. Bellamy, Ph.D.  
Puran S. Bora, Ph.D.  
Alan J. Budney, Ph.D.  
Mario Cleves, Ph.D.  
Joshua Epstein, D.Sc.  
Charlotte A. Hobbs, M.D., Ph.D.  
Robert Jilka, Ph.D.  
Stavros Manolagas, M.D., Ph.D.  
Charles A. O'Brien, Ph.D.  
Alison Oliveto, Ph.D.  
Steve Post, Ph.D.  
Mildred Randolph, D.V.M.  
Sudhir V. Shah, M.D.  
Jeanne Y. Wei, M.D., Ph.D.

#### ASSOCIATE PROFESSORS

Kumuda C. Das, Ph.D.  
Sherry A. Ferguson, Ph.D.  
Jeffery R. Kaiser, M.D.  
Mayumi Nakagawa, M.D., Ph.D.  
Gal Shafirstein, D.Sc.  
Catherine Stanger, Ph.D.

#### ASSISTANT PROFESSORS

Aline Andres, Ph.D.  
Sarah J. Blossom, Ph.D.  
Lawrence P. Carter, Ph.D.  
Yuzhi Chen, Ph.D.  
Marsha Eigenbrodt, M.D., M.P.H.  
Andrew James, Ph.D.  
Stewart MacLeod, Ph.D.  
Kartik Shankar, Ph.D.  
Sundaraman Swaminathan, M.D.  
Sabine Telemaque, Ph.D.  
Cheng Wang, M.D., Ph.D.

### Degrees Conferred: M.S., Ph.D., (IBSD)

**Program Description.** The IBS Graduate Degree Program is a multi-departmental program with specialized Interdisciplinary Tracks that provide students the opportunity to receive in-depth and integrated training in focal areas of biomedical science. The following Interdisciplinary Tracks are offered:

- **Aging Biology**
- **Cancer Biology**
- **Cell Biology**
- **Cellular and Molecular Immunology & Immunopathology**
- **Clinical and Translational Sciences**
- **Infectious Disease & Pathogenesis**
- **Interdisciplinary Neurosciences**

A goal of the IBS Graduate Program is to provide students with a broad range of knowledge in biomedical sciences that will prepare them for careers in interdisciplinary and translational research through coursework and advanced research training. Coursework during the first year will provide core knowledge at the cellular/molecular level as well as the level of the integrated organism. Advanced courses required by the Interdisciplinary Tracks, and additional electives chosen by the student and committee, provide a course of study unique and individualized to each student.

Under the **Basic Sciences Core Curriculum** students take coursework and conduct research leading to a M.S. or Ph.D. In addition to coursework, Ph.D. students enrolled in the first year of the IBS program rotate through at least three laboratories of individual graduate faculty members to help facilitate selection of a major doctoral advisor. By the end of the first year, Ph.D. students join an IBS Interdisciplinary Track, and choose a doctoral advisor and advisory committee. Near the end of the second year, Ph.D. students take the candidacy examination that consists of preparing a written research proposal and orally defending the proposal to their committee. Once they pass their candidacy exam they officially begin their dissertation research. The Ph.D. is awarded upon successful completion and defense of the dissertation. Ph.D. students under the Basic Sciences Core Curriculum are supported by a stipend for the first 18 months, after which stipend support shifts over to research projects or other sources.

M.S. students under the Basic Sciences Core Curriculum chose between taking the thesis or non-thesis option. Students selecting the thesis option must complete and defend a laboratory research based thesis. Student selecting the non-thesis option must pass a written comprehensive examination. Stipends are not available to M.S. students; international applicants for this degree must provide an Affidavit of Support to be considered.

The **IBS Clinical Research Training Curriculum–Clinical and Translational (CTS) Track** prepares researchers in the design, implementation and interpretation of clinical research through coursework in biostatistics, epidemiology, data management and analyses, clinical research methodology, clinical trials design, drug development, responsible conduct of research, grant writing and scientific communications. This unique curriculum is described under the CTS Track. Three levels of degrees are offered: Certificate, M.S. (both thesis and non-thesis options) and Ph.D. Students entering the M.S. or Ph.D. programs must already hold an advanced biomedical degree, or enter through the Certificate program. The Clinical Research Training Curriculum currently does not offer stipend support; therefore, international applicants must provide an Affidavit of Support for consideration.

**Prerequisites for Admission into IBS Graduate Programs.** Students qualified for admission to Graduate School should have a sound background in science that includes courses in inorganic chemistry, organic chemistry, physics and biology. A record of broad training in all these areas is obviously beneficial; however, students lacking training in an area can defray that deficiency by demonstrating advanced coursework in other disciplines of science.

Prospective students must submit the following credentials to the UAMS Graduate School:

- 1) Application to Graduate School.
- 2) Official transcripts of all undergraduate and graduate coursework.
- 3) Official Graduate Record Examination (GRE) results.
- 4) A statement of the applicant's career goals and reasons for seeking a graduate degree. This statement should also list any scholastic honors, experience (research and teaching), publications, and relevant extracurricular activities.
- 5) Three letters of recommendation from individuals familiar with the applicant.
- 6) International applicants whose native language is not English are required to submit the results of the TOEFL examination.

**Prerequisites for Admission into Clinical Research Training Curriculum (CTS Track).** Applicants for the M.S. or Ph.D. must hold an advanced degree in a biomedical field such as an M.D., R.N., M.S.N., Pharm.D., M.P.H., Dr.P.H., Ph.D., or have completed the requirements for a Certificate. Applicants for the Certificate must hold at least a bachelor's level degree or equivalent. Applicants holding other degrees with

significant experience in clinical research management or clinical experience may petition the Dean of the Graduate School for consideration by submitting supporting evidence of qualifications along with their request.

Because applicants already hold an advanced degree, the requirements for applying to the Clinical Research Training Curriculum–CTS Track differ. Applicants must submit the following to the UAMS Graduate School:

- 1) Application to Graduate School.
- 2) Curriculum vitae or resume.
- 3) Official transcripts from qualifying degree program.
- 4) Two letters of recommendation or support.

**IBS Basic Sciences Core Curriculum** (all students, except Clinical Research Training Curriculum–CTS Track)

Because of the interdisciplinary nature of IBS graduate training, many courses are selected from courses offered by other UAMS graduate programs. The descriptions for these courses can be found in the appropriate catalog sections according to the course number prefix: BIOC, see Biochemistry and Molecular Biology; BIOM, see Biostatistics; MBIM, see Microbiology and Immunology; NBDS, see Neurobiology and Developmental Sciences; PCOL, see Pharmacology; PHYO, see Physiology and Biophysics.

Course numbers for IBS Graduate Program courses are prefixed by “IBSD”. The course descriptions for IBS courses can be found at the end of this catalog section.

**Year 1—Fall Semester**

Course Name (Course Number)	Credits
• Biochemistry & Molecular Biology (BIOC5103)	3*
• Cell Biology (NBDS5093)	3*
• Gene Expression (PHYO5143)	3*
• Scientific Communication & Ethics (PCOL5211)	1
• IBS Seminar (IBSD5051)	1
• IBS Research (IBSD501V)	1#

**Year 1—Spring Semester**

• Selectives (select 2 of the following 5 courses, all are 3 credit hours)	6*
o General Physiology (PHYO5013)	
o General Principles Pharmacology & Toxicology (PCOL5033)	
o Immunology (MBIM5003)	
o Basic Principles of Microbiology (MBIM5023)	
o Cellular/Developmental Neurosciences (NBDS5103)	
• Elective #1 (may fulfill a track requirement)	3*
• Scientific Communication & Ethics (PCOL5221)	1
• IBS Seminar (IBSD5051)	1
• IBS Research (IBSD501V)	1#

**Year 1—Summer Term**

• IBS Research (IBSD501V)	1#
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**Year 2—Fall, Spring and Summer**

• Biostatistics I (BIOM5013)	3*
• Elective #2 (may fulfill a track requirement)	3*
• Other electives	varies
• Scientific Communication & Ethics (PCOL5231 and PCOL5241)	2 (1 per semester)
• IBS Seminar (IBSD5051)	2 (1 per semester)
• IBS Research (IBSD501V)	varies#
• M.S. students in the thesis option take Masters Thesis (IBSD600V); a minimum of 6 semester credit hours is required for the M.S.–Thesis Option.	

**Beyond Year 2—**

- All students are required to take IBS Seminar (IBSD5051) each semester.
- Ph.D. Students that have passed their candidacy exam take Doctoral Dissertation Research (IBSD700V); a minimum of 18 semester credit hours is required for graduation.

**Notes**

The order of course work may vary depending upon course offerings available.

\* Indicates didactic course requirement.

# Not required for M.S.

**Requirements of the Masters of Science Degree.****M.S.—Non-Thesis Option.**

1. Students must complete a minimum of 36 semester credit hours made up of the following:
  - Didactic coursework from the IBS Core Curriculum (designated with \* in curriculum listing).
  - Scientific Communications and Ethics: PCOL5211 and PCOL5221.
  - IBS Seminar (up to 4 credit hours)
  - Electives.
2. Students must pass a comprehensive examination after the completion of course work. An Examination Subcommittee of the IBS Advisory Committee will administer the exam, generally during the summer session after completion of most of the course requirements.
3. Students are responsible for meeting the requirements of the IBS graduate program and all other University requirements and deadlines for the M.S. degree.

**M.S.—Thesis Option.**

1. Students must complete a minimum of 36 semester credit hours made up of the following:
  - 6 credit hours of Master's Thesis Research (IBSD600V).
  - Didactic coursework from the IBS Core Curriculum (designated with \* in curriculum listing).
  - Scientific Communications and Ethics: PCOL5211 and PCOL5221.
  - IBS Seminar (up to 4 credit hours)
  - Electives.
2. The student will conduct laboratory research under the direction of a thesis advisor and thesis committee that results in the preparation of a Master's thesis that is presented in a public seminar, and defended in a closed meeting with the student, advisor and committee.
3. Students are responsible for meeting the requirements of the IBS graduate program and all other University requirements and deadlines for the M.S. degree.

**Requirements for the Doctor of Philosophy Degree.**

1. Students must complete a minimum of 24 semester credit hours of didactic course work (designated with \* in curriculum listing above). These 24 hours do not include research and seminar credits. The IBS Interdisciplinary Tracks and/or the doctoral advisory committees may require additional courses.
2. Student must pass the candidacy examination that consists of the preparation and oral defense of an original research proposal, to be administered by the research advisory committee chaired by the major advisor. Related material presented in the student's course work may be included in the oral portion of the examination.
3. After attaining candidacy, Ph.D. students will focus the majority of their time and efforts on developing, completing and defending a doctoral dissertation. Students must complete a minimum of 18 semester credit hours of Doctoral Dissertation Research (IBSD700V) and complete a doctoral dissertation based on original laboratory research work under the direction of the major doctoral advisor and advisory committee. The doctoral dissertation must be presented as a public seminar and then defended in a closed meeting of the student, the student's major doctoral advisor and the advisory committee.

4. Students are responsible for meeting the requirements of the IBS graduate program, the IBS Interdisciplinary Track in which they are affiliated, and all other University requirements and deadlines for the Ph.D. degree.

**Major Advisor, Advisory Committee and IBS Interdisciplinary Track Selection.** At the beginning of the second year Ph.D. students select a mentor-advisor and select to take specialized training in an IBS Interdisciplinary Track. Any faculty member of the UAMS Graduate Faculty is eligible to serve as a major advisor as long as the faculty member is a member of an IBS Interdisciplinary Track and has an active, funded research program, subject to approval by the IBS Director and the Dean of the Graduate School. After the student selects a major advisor, the student and advisor together select a research advisory committee composed of at least five members (including the major advisor), at least 3 of which must be members of the interdisciplinary track. Committee membership must be made up of members holding primary appointments in at least two departments at UAMS.

In order to provide flexible interdisciplinary training at UAMS, new IBS Interdisciplinary Tracks may be added to the IBS Graduate Program as the needs and interests of faculty and students demand. Please visit the IBS website (<http://www.uams.edu/ibs/tracks>) for a current listing of IBS Interdisciplinary Tracks and associated UAMS Graduate Faculty.

## **IBS-AGING BIOLOGY TRACK**

**Steven W. Barger, Ph.D.**, Track Leader  
4301 West Markham Street, #807, Little Rock, AR 72205, 501-526-5811

### **PROFESSORS**

**Steven W. Barger, Ph.D.**  
**Helen Benes, Ph.D.**  
**Puran Bora, Ph.D.**  
**Dana Gaddy, Ph.D.**  
**Sue Griffin, Ph.D.**  
**Robert L. Jilka, Ph.D.**  
**Charles O'Brien, Ph.D.**  
**Robert J. S. Reis, D. Phil.**  
**Larry Suva, Ph.D.**

**Jeanne Wei, M.D., Ph.D.**  
**Robert R. Wolfe, Ph.D.**  
**Piotr Zimniak, Ph.D.**

### **ASSISTANT PROFESSORS**

**Yuzhi Chen, Ph.D.**  
**Marsha Eigenbrodt, M.D., M.P.H.**  
**Masahiro Higuchi, Ph.D.**  
**Xiaomin Zhang, M.D., Ph.D.**

The Aging Biology Track is focused on education and research opportunities in diverse aspects of gerontology and geriatrics. The didactic and practical components of the program seek to apply hypotheses and discoveries about the basic biology of aging to practical challenges in gerontology and geriatrics of humans, including age-related disease and decline in function. Faculty provide research opportunities in areas including genetic influences on life span in invertebrates and mammalian animal subjects; cellular and molecular analysis of age-related conditions; animal models of osteoporosis, neurodegeneration, and cardiovascular disease; roles of nutrition and exercise on functionality in aging humans; and epidemiological analyses of health/function issues related to aging.

### **Track-Specific Course Requirements:**

Students in the Aging Biology Track take Biology of Aging (PHYO6073) as a primary course requirement. The student's major advisor and/or student's doctoral advisory committee may deem additional flexible instruction to be advantageous to the student's goals. Opportunities for personalized study in independent-study courses, journal clubs, and focused-reading formats (*e.g.*, Special Topics) are available.

## **IBS-CANCER BIOLOGY TRACK**

**Larry Suva, Ph.D.**, Track Leader

4301 West Markham Street, #644, Little Rock, AR 72205, 501-526-6110

### **PROFESSORS**

**Martin Cannon, Ph.D.**  
**Timothy Chambers, Ph.D.**  
**Joshua Epstein, D.Sc.**  
**Dana Gaddy, Ph.D.**  
**Angus MacNicol, Ph.D.**  
**Robert E. McGehee, Ph.D.**  
**Anna Radomska-Pandya, Ph.D.**  
**Robert J. S. Reis, D.Phil.**  
**Frank A. Simmen, Ph.D.**  
**Larry Suva, Ph.D.**

**Jerry Ware, Ph.D.**

### **ASSOCIATE PROFESSORS**

**Mari Davidson, Ph.D.**  
**Alan Diekman, Ph.D.**  
**Randy Haun, Ph.D.**  
**Thomas Kelly, Ph.D.**  
**Grover Paul Miller, Ph.D.**

### **ASSISTANT PROFESSORS**

**Masahiro Higuchi, Ph.D.**

The IBS Cancer Biology track is an interdisciplinary track administered through the Interdisciplinary Biomedical Sciences (IBS) Graduate Program designed to facilitate challenging student-faculty interactions covering all aspects of cancer biology. Opportunities are provided for students to experience fundamental aspects of cancer biology and oncology. The program provides graduate students with direct access to expertise from a number of different departments to develop scientists to meet future research challenges in oncology. Students have the opportunity to gather research experience that covers virtually all areas of cancer biology. Participating faculty come from across the University of Arkansas for Medical Sciences, the Winthrop P Rockefeller Cancer Institute, Arkansas Children's Hospital and the Veterans Administration Medical Center.

### **Track-Specific Course Requirements:**

Students in the Cancer Biology Track take at least one of the following:

- Biology of Cancer (BIOC6122)
- Molecular and Biochemical Pathobiology (PATH5043)

The student's major advisor and/or doctoral advisory committee may require additional courses.

## **IBS-CELL BIOLOGY TRACK**

**Brian Storrie, Ph.D.**, Track Leader

4301 West Markham Street, #505, Little Rock, AR 72205, 501-526-7418

### **PROFESSORS**

**Steve W. Barger, Ph.D.**  
**Helen Benes, Ph.D.**  
**Puran Bora, Ph.D.**  
**Timothy C. Chambers, Ph.D.**  
**Marie Chow, Ph.D.**  
**Parimal Chowdhury, Ph.D.**  
**Paul D. Drew, Ph.D.**  
**Dana Gaddy, Ph.D.**  
**Jill James, Ph.D.**  
**Michael Jennings, Ph.D.**  
**Robert L. Jilka, Ph.D.**  
**Angus M. MacNicol, Ph.D.**  
**Philip R. Mayeux, Ph.D.**  
**Robert E. McGehee, Ph.D.**  
**Donald Mock, M.D., Ph.D.**  
**Steve Post, Ph.D.**  
**Peter M. Price, Ph.D.**  
**Nancy J. Rusch, Ph.D.**  
**Rosalia C.M. Simmen, Ph.D.**

**Joseph R. Stimers, Ph.D.**  
**Brian Storrie, Ph.D.**  
**Wayne D. Wahls, Ph.D.**  
**Patricia Wight, Ph.D.**

### **ASSOCIATE PROFESSORS**

**Giulia Baldini, Ph.D.**  
**Thomas Kelly, Ph.D.**  
**Fusun Kilic, Ph.D.**  
**Vladmir Lupashin, Ph.D.**  
**Lee Ann MacMillan-Crow, Ph.D.**  
**Judit Megyesi, M.D.**  
**Kevin Phelan, Ph.D.**  
**Paul L. Prather, Ph.D.**  
**Alan Tackett, Ph.D.**  
**Fang Zheng, Ph.D.**

The IBS Cell Biology track is designed to foster student-faculty interactions in the areas of cellular organization and function, be they in single cells, tissue culture, model organisms, or in complex mammalian systems. What is cell biology is interpreted in a broad sense. Participating faculty are spread across the University of Arkansas for Medical Science, the Arkansas Children's Hospital and the associated Veterans Administration Medical Centers. Faculty research interests range from the bench to the bedside.

### **Track-Specific Course Requirements:**

Students in the Cell Biology Track take Molecular Cell Biology (MBIM6104). The student's major advisor and/or doctoral advisory committee may require additional courses.

## **IBS-CELLULAR AND MOLECULAR IMMUNOLOGY- IMMUNOPATHOLOGY TRACK**

**Lee S.F. Soderberg, Ph.D.**, Track Leader

4301 West Markham Street, #511, Little Rock, AR 72205, 501-686-6368

### **PROFESSORS**

**Steven W. Barger, Ph.D.**  
**Nalini Bora, Ph.D.**  
**Martin J. Cannon, Ph.D.**  
**Marie Chow, Ph.D.**  
**Paul D. Drew, Ph.D.**  
**Joshua Epstein, D.Sc.**  
**Martin Hauer-Jensen, M.D., Ph.D.**  
**Thomas Kieber-Emmons, Ph.D.**  
**S. Michael Owens, Ph.D.**  
**Usha Ponnappan, Ph.D.**  
**Steve Post, Ph.D.**  
**Roger G. Rank, Ph.D.**

**Mark S. Smeltzer, Ph.D.**  
**Lee S.F. Soderberg, Ph.D.**  
**Xuming Zhang, Ph.D.**

### **ASSOCIATE PROFESSORS**

**Alan Diekman, Ph.D.**  
**Kathleen M. Gilbert, Ph.D.**  
**Shanmugan Nagarajan, Ph.D.**  
**Mayumi Nakagawa, M.D., Ph.D.**

### **ASSISTANT PROFESSORS**

**Uma Nagarajan, Ph.D.**

Molecular & Cellular Immunology-Immunopathology is an interdisciplinary track administered through the Interdisciplinary Biomedical Sciences (IBS) Graduate Program. This graduate track provides graduate students with expertise from a number of different departments to develop scientists to meet future challenges in immunologically oriented medical research. Students participate in the active research program, contributing new information about immunological mechanisms relating to cancer immunotherapy, immune-mediated diseases, cytokines, vaccines, host response to infectious agents, or related problems.

### **Track-Specific Course Requirements:**

Students in the Cellular and Molecular Immunology/Immunopathology Track take the following track-specific courses:

- Immunology (MBIM5003; an IBS Core Curriculum selective).
- Two of the following:
  - Molecular Virology (MBIM5043)
  - Molecular and Biochemical Pathobiology (PATH5043)
  - Bacterial Genetics and Pathogenesis (MBIM5904)
  - Molecular Mechanisms in Immunology (MBIM6023)
  - Networks in Immunology (MBIM6033)
  - Molecular Cell Biology (MBIM6104)
- Current Topics in Immunology (MBIM5211; each semester beyond year 1).

The student's major advisor and/or doctoral advisory committee may require additional courses.

## **IBS-INFECTIOUS DISEASE AND PATHOGENESIS TRACK**

**Wayne L. Gray, Ph.D.**, Track Leader  
4301 West Markham Street, #511, Little Rock, AR 72205, 501-686-5187

### **PROFESSORS**

**Martin J. Cannon, Ph.D.**  
**Marie Chow, Ph.D.**  
**Kathleen D. Eisenach, Ph.D.**  
**Dana Gaddy, Ph.D.**  
**Wayne L. Gray, Ph.D.**  
**Chia Lee, Ph.D.**  
**Usha Ponnappan, Ph.D.**  
**Roger G. Rank, Ph.D.**  
**Mark S. Smeltzer, Ph.D.**  
**Lee S.F. Soderberg, Ph.D.**  
**Kevin Young, Ph.D.**  
**Xuming Zhang, Ph.D.**

### **ASSOCIATE PROFESSORS**

**Shanmugan Nagarajan, Ph.D.**

### **ASSISTANT PROFESSORS**

**Jon Blevins, Ph.D.**  
**Craig Forrest, Ph.D.**  
**Uma Nagarajan, Ph.D.**  
**Daniel Voth, Ph.D.**

The Infectious Disease and Pathogenesis Track offers interdepartmental training in microbiology, immunology, infectious diseases, and microbial pathogenesis.

### **Track-Specific Course Requirements:**

Students in the Infectious Disease and Pathogenesis Track take the following track-specific courses:

- Principles of Microbiology (MBIM5023; an IBS Core Curriculum selective)
  - Immunology (MBIM5003; an IBS Core Curriculum selective).
  - At least six credit hours of electives. The following are recommended for consideration:
    - Medical Microbiology (MBIM5033)
    - Molecular Virology (MBIM5043)
    - Molecular and Biochemical Pathobiology (PATH5043)
    - Bacterial Genetics and Pathogenesis (MBIM5904)
    - Molecular Mechanisms in Immunology (MBIM6023)
    - Networks in Immunology (MBIM6033)
- Other UAMS graduate courses may be considered, but must first be approved by the student's major advisor and the Infectious Disease and Pathogenesis Track Steering Committee.
- Current Topics in Microbiology (MBIM5201) or Current Topics in Immunology (MBIM5211); each semester beyond year 1.

The student's major advisor and/or doctoral advisory committee may require additional courses.

# IBS-INTERDISCIPLINARY NEUROSCIENCE TRACK

**David L. Davies, Ph.D.**, Track Leader

4301 West Markham Street, #510, Little Rock, AR 72205, 501-686-5184

## PROFESSORS

**Elie D. Al-Chaer, Ph.D., J.D.**  
**Steven W. Barger, Ph.D.**  
**Helen Benes, Ph.D.**  
**Alan J. Budney, Ph.D.**  
**Gwen V. Childs, Ph.D.**  
**Marie Chow, Ph.D.**  
**Parimal Chowdhury, Ph.D.**  
**Lawrence E. Cornett, Ph.D.**  
**Gerald A. Dienel, Ph.D.**  
**Paul D. Drew, Ph.D.**  
**Edgar Garcia-Rill, Ph.D.**  
**Paul Gottschall, Ph.D.**  
**W. Sue T. Griffin, Ph.D.**  
**Cynthia J.M. Kane, Ph.D.**  
**Kim E. Light, Ph.D.**  
**Angus M. MacNicol, Ph.D.**  
**Mark S., Mennemeier, Ph.D.**  
**Bruce W. Newton, Ph.D.**  
**S. Michael Owens, Ph.D.**  
**Robert D. Skinner, Ph.D.**  
**Galen R. Wenger, Ph.D.**  
**Patricia Wight, Ph.D.**  
**Xuming Zhang, Ph.D.**

## ASSOCIATE PROFESSORS

**Jason Y. Chang, Ph.D.**  
**David L. Davies, Ph.D.**  
**Abdallah Hayar, Ph.D.**  
**Kevin D. Phelan, Ph.D.**  
**Paul L. Prather, Ph.D.**  
**Catherine Stanger, Ph.D.**  
**William D. Wessinger, Ph.D.**  
**Fang Zheng, Ph.D.**

## ASSISTANT PROFESSORS

**Yuzhi Chen, Ph.D.**  
**Melanie C. MacNicol, Ph.D.**

## NON-UAMS GRADUATE FACULTY

**Syed F. Ali, Ph.D.**  
**John F. Bowyer, Ph.D. (NCTR)**  
**Sherry A. Ferguson, Ph.D. (NCTR)**  
**Merle G. Paule, Ph.D. (NCTR)**  
**William Slikker, Jr., Ph.D. (NCTR)**

The University of Arkansas for Medical Sciences offers interdepartmental training in Neuroscience involving graduate faculty in the Interdisciplinary Biomedical Sciences Program and the Departments of Neurobiology and Developmental Sciences, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology and Biophysics. In order to furnish students with the breadth of training to pursue research problems in diverse areas of neurobiology, the Interdisciplinary Neuroscience Track provides a broad background in basic neurobiology, in-depth experience in one of the participating academic disciplines, and extensive training in the application of modern experimental methods to fundamental problems in neurobiology. A broad series of courses is offered that spans the various disciplines of neurobiology. More than thirty graduate faculty members participate in the Neuroscience Graduate Track. Their research encompasses most of the areas of modern neurobiology including vertebrate neurophysiology, membrane biophysics, neuropharmacology, behavioral pharmacology, molecular neurobiology, and developmental neurobiology. The participating graduate programs have extensive research facilities in all areas of neurobiology.

### Track-Specific Course Requirements:

Students in the Interdisciplinary Neurosciences Track are required to take at least six credit hours of neuroscience electives. The electives listed below are recommended for consideration:

- Medical Neuroscience (NBDS5035)
- Neurophysiology of Voluntary Movement (NBDS5071)
- Current Topics in Neurobiology (NBDS5081)
- Cellular and Developmental Neuroscience (NBDS5103)
- Systems Neuroscience (NBDS5153)
- Behavioral Pharmacology & Toxicology (PCOL5123)

- Neuropharmacology (PCOL5133)
- Cellular Endocrinology (PHYO5033)
- Human Neuroscience and Neuroimaging (IBSD5303)

Other courses, not listed, may be considered, but must first be approved by the Interdisciplinary Neuroscience Track Steering Committee to count toward the required six hours of neuroscience electives.

## IBS-CLINICAL AND TRANSLATIONAL SCIENCES (CTS) TRACK

William D. Wessinger, Ph.D., Track Leader  
4301 West Markham Street, #611, Little Rock, AR 72205, 501-686-5514

### PROFESSORS

Sameh Abul-Ezz, MBCH.B., Dr.P.H.  
Aline Andres, Ph.D.  
Alexei G. Basnakian, M.D., Ph.D.  
Cornelia Beck, Ph.D.  
Puran S. Bora, Ph.D.  
Alan J. Budney, Ph.D.  
Mario Cleves, Ph.D.  
Elizabeth Ann Coleman, Ph.D., R.N.  
Edgar Garcia-Rill, Ph.D.  
W. Brooks Gentry, M.D.  
Martin Hauer-Jensen, M.D., Ph.D.  
Jack Hinson, Ph.D.  
Charlotte Hobbs, M.D., Ph.D.  
Laura James, M.D.  
Kim E. Light, Ph.D.  
Curtis Lowery, M.D.  
Starvos Manolagas, M.D., Ph.D.  
Bradley C. Martin, Pharm.D., Ph.D.  
Glen P. Mays, Ph.D.  
Robert E. McGehee, Jr., Ph.D.  
Jeanne McSweeney, Ph.D., R.N.  
Donald W. Mock, M.D., Ph.D.  
Mayumi Nakagawa, M.D., Ph.D.  
Alison Oliveto, Ph.D.  
S. Michael Owens, Ph.D.  
Anna J. Radomska-Pandya, Ph.D.

### PROFESSORS (continued)

Nancy Rusch, Ph.D.  
Robert Safirstein, M.D.  
Sudhir V. Shah, M.D.  
Katharine E. Stewart, Ph.D., M.P.H.  
Galen R. Wenger, Ph.D.  
Delia Smith West, Ph.D.

### ASSOCIATE PROFESSORS

Lee Ann MacMillan-Crow, Ph.D.  
Carmen T. Paniagua, Ed.D., R.N., M.S.N.,  
A.P.N., A.C.N.P.-B.C.  
Gal Shafirstein, D.Sc.  
Catherine Stanger, Ph.D.  
William D. Wessinger, Ph.D.

### ASSISTANT PROFESSORS

Sarah Blossom, Ph.D.  
Marsha Eigenbrodt, M.D., M.P.H.  
Howard Hendrickson, Ph.D.  
Stewart MacLeod, Ph.D.  
Sundararaman Swaminathan, M.

### NON-UAMS GRADUATE FACULTY

Jeffery Moran, Ph.D. (Arkansas  
Department of Health)

### Requirements for Ph.D. students following the IBS Basic Sciences Core Curriculum:

The CTS Track offers advanced training in clinical and translational sciences to IBS Ph.D. students taking the **IBS Basic Sciences Core Curriculum**, who are conducting their dissertation research in a relevant clinical and/or translational area.

Students in the CTS Track taking the IBS Basic Sciences Core Curriculum (described earlier) are required to take the following additional track-specific courses:

- Statistical Methods for Clinical Trials (BIOM5133)
- Epidemiology I (BIOM5173)

Other courses may be considered if relevant to the student's dissertation research, but first must be approved by the student's major advisor and the Track Leader. The student's major advisor and/or doctoral advisory committee may require additional courses.

### Requirements for students in the Clinical Research Training Curriculum–CTS Track:

The CTS Track also offers an advanced Clinical Research Training Curriculum for students already holding an advanced biomedical degree (M.S., and Ph.D. training programs), or for students holding a bachelors degree (Certificate training program). These students take a unique curriculum (see **Clinical Research Training Curriculum–CTS Track Curriculum**, below) that prepares researchers in the design, implementation and interpretation of clinical research through coursework in biostatistics, epidemiology, data management and analyses, clinical research methodology, clinical trials design, drug development, responsible conduct of research, grant writing and scientific communications. Certificate level, Master's level (both thesis and non-thesis options) and Ph.D. level training are offered.

## Clinical Research Training Curriculum–CTS Track (M.S. and Ph.D. students)

Because of the interdisciplinary nature of Clinical and Translational Sciences, coursework comes from a variety of UAMS graduate programs, as well as from graduate programs in several different colleges on the UAMS campus, including the College of Medicine (COM), College of Nursing (CON), College of Pharmacy (COP) and College of Public Health (COPH). The descriptions for most courses can be found in the appropriate sections of the Graduate School Catalog according to the course number prefix: BINF, see Bioinformatics; BIOM, see Biostatistics; HSRE, see Health Systems Research; NUSC, see Nursing Science; PBHL, see Public Health; PCOL, see Pharmacology; PHSC, see Pharmaceutical Sciences.

Course numbers for IBS Graduate Program courses are prefixed by “IBSD”. The course descriptions for IBS courses can be found at the end of this catalog section.

### Year 1—Fall and Spring Semesters

Course Name (Course Number-UAMS College offering)	Credits
• Biostatistics I (BIOM5013-COPH)	3
• Epidemiology I (BIOM5173-COPH)	3
• Statistical Methods for Clinical Trials (BIOM5133-COPH)	3
• Scientific Communication & Ethics I and II (PCOL5211, PCOL5221-COM)	2 (1 per semester)
• IBS Seminar (IBSD5051-COM)	2 (1 per semester)
<i>Electives (9 credit hours; see partial listing below)</i>	9
<i>Research Elective (with approval of Track Leader)</i>	
• Research (IBSD501V, credit varies)	varies

### Year 1—Summer Term

<i>Research Electives</i>	
• Research (IBSD501V, credit varies, with approval of Track Leader)	varies
• Thesis Research (IBSD600V, credit varies, M.S.—Thesis pathway only)	varies
• Dissertation Research (IBSD700V, credit varies, Ph.D. only)	varies

### Year 2—Fall, Spring and Summer

• IBS Seminar (IBSD5051)	2 (1 per semester)
<i>Electives</i>	
• Selected in consultation with Track Leader, Advisor and Thesis or Dissertation Committee depending upon degree path.	
<i>Research Electives</i>	
• Research (IBSD501V, credit varies, with approval of Track Leader)	varies
• Thesis Research (IBSD600V, credit varies, M.S.—Thesis option only)	varies
• Dissertation Research (IBSD700V, credit varies, Ph.D. only)	varies

### Electives

• Application of Microcomputers to Data Management and Analysis (PBHL5753-COPH)	3
• Categorical Data Analysis (PBHL5763-COPH)	3
• Biostatistics II (BIOM5023-COPH)	3
• Biostatistics III (BIOM5033-COPH)	3
• Epidemiology II (BIOM5183-COPH)	3
• Epidemiology III (BIOM593-COPH)	3
• Implementation of Change in Clinical Settings (HSRE9653-COPH)	3
• Applied Research Methods Using Retrospective Data (PHSC5343-COP, even years)	3
• Scientific Communication & Ethics III and IV (Grant Writing; PCOL5231, PCOL5241-COM)	2 (1 per semester)
• Bioinformatics Theory and Application (BINF5445-UALR)	4
• Special Topics in IBS (IBSD604V-COM)	varies

**Clinical Research Training Curriculum–CTS Track Degree Requirements.** In order to provide flexibility, other courses not currently listed among the selections may be substituted with prior approval of the Track Leader.

**Requirements for Certificate (CTS Certificate).**

Students take a subset of the Clinical Research Training Curriculum–CTS Track completing a minimum of 13 semester credit hours made up of coursework and research rotations, as follows:

1. Coursework
  - Biostatistics I (BIOM5013-COPH)
  - Two didactic electives (3 or 4 credit hours only) from list above. Note, electives can also include Epidemiology I (BIOM5173-COPH) and Statistical Methods for Clinical Trials (BIOM5133-COPH). Other courses can be substituted with permission of the Track Leader.
2. The student must complete two research rotations (Research (IBSD501V, credit varies, 4 credits total are required) under the direction of a CTS Track faculty member, with approval of the Track Leader. Minimum requirement for research rotations (two required) are: 6 contact hours per week for 6 weeks.

Credits earned with grades of A or B toward the CTS Certificate can be applied toward further education.

**Requirements of the Masters of Science Degree.**

**M.S.—Non-Thesis Option.**

1. Students must complete a minimum of 36 semester credit hours from the Clinical Research Training Curriculum.
2. Students must pass a comprehensive examination after the completion of course work.
3. Students are responsible for meeting the requirements of the IBS graduate program and the CTS Track, and all other University requirements and deadlines for the M.S. degree.

**M.S.—Thesis Option.**

1. Students must complete a minimum of 36 semester credit hours made up of the following:
  - 6 credit hours of Master’s Thesis Research (IBSD600V).
  - 30 credit hours of course work from the Clinical Research Training Curriculum.
2. The student will conduct laboratory research under the direction of a thesis advisor and thesis committee that results in the preparation of a Master’s thesis that is presented in a public seminar, and defended in a closed meeting with the student, advisor and committee.
3. Students are responsible for meeting the requirements of the IBS graduate program and the CTS Track, and all other University requirements and deadlines for the M.S. degree.

Credits earned with grades of A or B toward the M.S. can be applied toward further education.

**Requirements for the Doctor of Philosophy Degree.**

1. The minimum course requirements for graduating with a Ph.D. degree in IBS for the Clinical Research Training Curriculum–CTS Track include 36 semester credit hours earned taking the Core Curriculum. The doctoral advisory committees may require additional courses.
2. Students must pass the candidacy examination that consists of the preparation and oral defense of an original research proposal, to be administered by the research advisory committee chaired by the major advisor. Related material presented in the student’s course work may be included in the oral portion of the examination.
3. After attaining candidacy, Ph.D. students will focus the majority of their time and efforts on developing, completing and defending a doctoral dissertation. Students must complete a minimum of 18 semester credit hours of Doctoral Dissertation Research (IBSD700V) and complete a doctoral

dissertation based on original laboratory research work under the direction of the major doctoral advisor and advisory committee. The doctoral dissertation must be presented as a public seminar and then defended in a closed meeting of the student, the student's major doctoral advisor and the advisory committee.

4. Students are responsible for meeting the requirements of the IBS graduate program specific to the CTS Track, and all other University requirements and deadlines for the Ph.D. degree.

**Major Advisor and Advisory Committee Selection.** By the beginning of the second year Ph.D. students in the Clinical Research Training Curriculum–CTS Track select a mentor-advisor. Any faculty member of the UAMS Graduate Faculty is eligible to serve as a major advisor as long as the faculty member is a member of the IBS CTS Track and has an active, funded research program in clinical and translational sciences, subject to approval by the IBS Director and the Dean of the Graduate School. The student and advisor together select a research advisory committee composed of at least five members (including the major advisor), at least 3 of which must be members of the CTS Track. At least one member of the committee must be a practicing clinician or clinician researcher. Committee membership must be made up of members holding primary appointments in at least two departments at UAMS.

Please visit the IBS website for the CTS Track (<http://www.uams.edu/ibs/tracks/CTS.asp>) for a current listing of CTS Track faculty.

## **Courses Offered by the Interdisciplinary Biomedical Sciences Graduate Program (IBSD)**

- IBSD 5051**      **IBS Seminar** (I, II) Students will attend weekly seminars. Seminars will be assigned, or students may be permitted to select topics according to their research interests. Students beyond the second year will present seminars related to their original research. Grades will be based on presentations and on brief student reports about the seminars they attended.
- IBSD 501V**      **IBS Research** (I, II, S) Students will participate in research projects under the supervision of a faculty member in the Interdisciplinary Biomedical Sciences Graduate Degree Program.
- IBSD 5303**      **Human Neuroscience and Neuroimaging** (I) This course describes the use of functional neuroimaging (specifically, magnetic resonance imaging) to enhance our understanding of human cognition and psychiatric condition. Lectures will encompass MRI physics, experimental design, neurobiology, and advanced statistical analyses. Computer-based workshops will supplement training in these techniques. Prerequisite: NBDS 5153 or course director's permission.
- IBSD 600V**      **Masters Thesis** (1–6 credit hours) (I, II, S). Prerequisites: Graduate student standing and preceptor consent.
- IBSD 604V**      **Special Topics in IBS** (1–3 credit hours) (On demand) In-depth study of current topics in biomedical sciences or advanced study of specialized topics not covered elsewhere. Instructional techniques may include directed reading, group discussion, lectures, web-based instruction or other innovative methods. Performance evaluation may be based on participation, graded discussion, student presentations or writing assignments. Prerequisites: Consent.
- IBSD 700V**      **Doctoral Dissertation** (I, II, S) Prerequisite: Candidacy and consent

## INTERDISCIPLINARY TOXICOLOGY (INTX)

**Lee Ann MacMillan-Crow, Ph.D.**, INTX Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5766

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

Alexei Basnakian, M.D., Ph.D.  
John P. Crow, Ph.D.  
William Fantegrossi, Ph.D.  
Kim Fifer, Ph.D.  
Jay Gandy, Ph.D.  
William B. Gentry, M.D.  
Paul E. Gottschall, Ph.D.  
Jack A. Hinson, Ph.D.  
Laura P. James, M.D.  
Kim E. Light, Ph.D.  
S. Jessie Liu, Ph.D.  
Lee Ann MacMillan-Crow, Ph.D.  
James D. Marsh, M.D.  
Philip R. Mayeux, Ph.D.  
S. Michael Owens, Ph.D.  
Philip Palade, Ph.D.  
Steven Post, Ph.D.  
Robert Reis, Ph.D.  
Martin J.J. Ronis, Ph.D.  
Nancy J. Rusch, Ph.D.  
Joseph Stimers, Ph.D.  
Galen R. Wenger, Ph.D.  
Piotr Zimniak, Ph.D.

#### ASSOCIATE PROFESSORS

Kathleen Gilbert, Ph.D.  
Paul L. Prather, Ph.D.  
Henry Simmons, M.D., Ph.D.  
William D. Wessinger, Ph.D.  
Fang Zheng, Ph.D.

#### ASSISTANT PROFESSORS

Eric C. Peterson, Ph.D.  
Sung W. Rhee, Ph.D.  
Lawrence Carter, Ph.D.

#### NON-UAMS GRADUATE FACULTY

Carl E. Cerniglia, Ph.D., NCTR  
Barry K. Delclos, Ph.D., NCTR  
Peter P. Fu, Ph.D., NCTR  
Phillip T. Goad, Ph.D., NCTR  
Deborah K. Hansen, Ph.D., NCTR  
Robert Heflich, Ph.D., NCTR  
Julian E. Leakey, Ph.D., NCTR  
Glen C. Milner, Ph.D., NCTR  
Alan C. Nye, Ph.D., NCTR  
Tucker Patterson, Ph.D., NCTR  
Merle G. Paule, Ph.D., NCTR  
Igor Pogribny, Ph.D., NCTR  
William Slikker, Jr., Ph.D., NCTR

#### Degrees Conferred: Ph.D.

Toxicology is the study of the adverse effects of external factors (free radicals, chemicals, poisons, or drugs) on living systems. In addition, toxicologists are also interested in the inherent mechanisms that mediate the toxic insults to biological or environmental systems. Well-trained toxicologists are needed in a wide range of jobs, and the long-term career opportunities for these individuals are good. Toxicologists find employment in academic institutions, private industry and government laboratories. Therefore, they are often at the center of the development of new therapeutic agents, the testing of their safety and the regulation of their use.

A major goal of the UAMS Graduate Program in Toxicology in the College of Medicine is to provide students with the necessary course work and research training that will allow our graduates to make a positive contribution both in research and teaching in years to come. In addition to courses in the basic principles of drug action, general pharmacology and toxicology, all students study the basic sciences of cell biology, physiology, biochemistry, and biometry. Additional specialty courses are offered in molecular foundations of toxicology, systems or organ-based toxicology, clinical toxicology, and experimental toxicology. Since research is an important part of graduate training, students will complete 3 research

rotations within the first year of training, at which time they will select their graduate mentor. Most of the formal didactic course work will be completed in the first two years of study leading to the Ph.D. degree. Upon completion of the second year of training, students must pass written and oral qualifying examinations in order to enter formal candidacy for the doctoral degree. Subsequently, the student will complete a research project under the supervision of a qualified faculty member. The research project must be defended in both oral and written (dissertation) forms before the granting of the Ph.D. degree.

**Prerequisites to Degree Program.** Applicants should have an undergraduate grade-point average of 3.0 or higher and above average scores on the Graduate Record Examination. Prerequisite coursework should include satisfactory completion of undergraduate courses in mathematics, general chemistry, organic chemistry and biology. Other important, but not required, courses are biochemistry, physiology and anatomy, calculus, and statistics. On occasion, other advanced coursework may be substituted for certain required classes.

**Requirements for the Doctor of Philosophy Degree.** The Ph.D. degree will be awarded to candidates who successfully complete the required course work (minimum of 32 semester hours of coursework), and dissertation research hours (minimum of 18 credit hours of dissertation research). The current program requirements are posted on the Departmental website (<http://pharmtox.uams.edu/toxicology>).

### **Interdisciplinary Toxicology (INTX)**

**PCOL 5033 General Principles of Pharmacology and Toxicology (II)** This course offers an overview of the principles and general mechanisms underlying the effects of drugs and chemicals on biological systems. The application of these principles to proper experimental design is also considered.

**PCOL 5203/5213 Experimental Pharmacology and Toxicology I and II (II, I)** In these two courses, student will obtain a basic understanding of the latest techniques in experimental pharmacology and toxicology with an emphasis on animal models of human disease. Material will be presented in formal lectures and demonstrations. Prerequisites for PCOL 5203 are PCOL 5033 or consent of the course director. Prerequisites for PCOL 5213 are PCOL 5033 and PCOL 500V or consent of the course director.

**INTX 5113 Molecular Foundations of Toxicology (I)** This course will provide students with an understanding of these approaches, in particular, their strengths and limitations. Each lecture topic will be followed by a session that will be in the format of a journal club presentation by the students on the previous lecture topic. Prerequisites: BIOC 5103; PHYO 5013; and PCOL 5033.

**INTX 5123 Systems Toxicology (II)** This course is focused on understanding the molecular basis of organ injury caused by relevant chemical agents/drugs. Each topic will include one or two didactic lectures, followed by a final class period which will focus on evaluation of a peer-reviewed journal article dealing with the subject. Prerequisites: BIOC 5103; PHYO 5013; and PCOL 5033.

**INTX 6653 Clinical Toxicology (II)** In this course, students will obtain a basic understanding of the latest developments in clinical toxicology with the emphasis on drug-induced adverse effects and poisonings. Material will be presented in formal lectures and demonstrations. Prerequisite is INTX 5033 or consent of the course director.

**PCOL 500V Medical Pharmacology (I, II)** Lecture material systematically covers all major drugs of medical interest. Each drug is considered from the standpoint of fundamental modes of action on the various body systems, therapeutic uses, available preparations, and toxicity. Prerequisite: PHYO 5013 or equivalent.

- PCOL 5043**     **Medical Pharmacology for INTX graduate students (I, II)** Selected lectures from the medical school course which are pertinent to the INTX curriculum.
- INTX 501V**     **Research in Pharmacology and Toxicology (1-9) (I, II)** Students will participate in research projects under the supervision of a faculty member. (Same as PCOL501V)
- INTX 700V**     **Doctoral Dissertation (INTX 700V):** After a student has passed the candidacy exam, he/she must register for at least 1 hour of Doctoral Dissertation (PCOL 700V) each Fall, Spring, and Summer term. In addition, a student must have completed at least 18 credit hours of Doctoral Dissertation (INTX 700V) before the degree can be conferred. No credit can be earned for INTX 700V until after the Declaration of Intention has been filed.
- PCOL 5201**     **Pharmacology and Toxicology Journal Club (I, II)** Students will read recent, high profile contributions to the Pharmacology/Toxicology literature, present a summary of the paper, critique the methodology and data interpretation, and encourage discussion among the class/attendees. All enrolled students must present a paper. First year students are required to attend, but they are not required to present a paper.
- INTX 5051**     **Pharmacology and Toxicology Seminar (I, II)** Students in both Pharmacology and Interdisciplinary Toxicology programs will participate in this course and prepare a presentation on one or more topics related to their original research.
- PCOL 5211**     **Scientific Communication and Ethics I** This course will provide formal training in scientific communication and ethics to students in the first and second years of graduate school. Various faculty within and outside the department will lead discussion concerning how to write and publish scientific studies and ethical conduct related to science. Students will also prepare an oral presentation of recent peer reviewed research.
- PCOL 5221**     **Scientific Communication and Ethics II** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5211
- PCOL 5231**     **Scientific Communication and Ethics III** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5221
- PCOL 5241**     **Scientific Communication and Ethics IV** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5231

## MICROBIOLOGY AND IMMUNOLOGY (MBIM)

**Marie Chow, Ph.D.**, MBIM Graduate Program Director  
UAMS, 4301 West Markham, Little Rock, Arkansas 72205, 501-686-5155

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

**Nalini Bora, Ph.D.**  
**Martin Cannon, Ph.D.**  
**Marie Chow, Ph.D.**  
**Wayne L. Gray, Ph.D.**  
**Paul Hermonat, Ph.D.**  
**Thomas Kieber-Emmons, Ph.D.**  
**Chia Y. Lee, Ph.D.**  
**Richard P. Morrison, Ph.D.**  
**Usha Ponnappan, Ph.D.**  
**Roger G. Rank, Ph.D.**  
**Mark S. Smeltzer, Ph.D.**  
**Lee S.F. Soderberg, Ph.D.**  
**Kevin D. Young, Ph.D.**  
**Xuming Zhang, Ph.D.**

#### ASSOCIATE PROFESSORS

**Kathleen Gilbert, Ph.D.**  
**Shanmugam Nagarajan, Ph.D.**

#### ASSISTANT PROFESSORS

**Jon S. Blevins, Ph.D.**  
**James Craig Forrest, Ph.D.**  
**Uma Nagarajan, Ph.D.**  
**Jason Stumhofer, Ph.D.**  
**Daniel E. Voth, Ph.D.**

#### NON-UAMS GRADUATE FACULTY

**Randall Owens, Ph.D., Arkansas**  
**Department of Health**

Research is the most important aspect of the Ph.D. and M.S. degrees offered by the Department of Microbiology and Immunology. Students are expected to actively participate in the Departmental research program, contributing new information about immunobiology, immune defenses and infectious diseases. Because of the breadth of our training, graduates from the MBIM program have a large variety of job opportunities at university/medical school, government, and industry research laboratories. In the first year of the graduate program, students will complete a core curriculum of didactic courses and rotations in three potential faculty laboratories. At the end of the second semester of Graduate School, students choose a faculty advisor with extramural research funding and select a research project in the advisor's laboratory. Descriptions of faculty research interests can be found at [http://www.uams.edu/mbim/folderone/Microbial\\_Path.asp](http://www.uams.edu/mbim/folderone/Microbial_Path.asp) and [http://www.uams.edu/mbim/folderone/Immunology\\_Immunopath.asp](http://www.uams.edu/mbim/folderone/Immunology_Immunopath.asp)

### Degrees Conferred: M.S., Ph.D. (MBIM)

**General Requirements and Information.** Applicants must be admitted to the Graduate School of the University of Arkansas for Medical Sciences, and be approved by the Department of Microbiology and Immunology.

**Areas of Concentration:** There are two programs leading to the M.S. or Ph.D. degrees: (1) Microbial Pathogenesis and Genetics, (2) Immunology.

**Prerequisites to Degree Program.** Applicants should have a baccalaureate degree from an accredited university or college in a biological science or a related field with strong biological background. It is strongly recommended that the applicant have satisfactorily completed courses in chemistry (both general and organic) biochemistry, genetics, molecular biology, and cell biology. Prior research experience is also strongly recommended. All applicants must submit scores for the general GRE (Graduate Record Examinations), field specialty examinations are not required. A good command of the English language is

essential. The applicant should submit three letters of recommendation, preferably from former teachers and research advisors who can assess the applicant's potential in a research career, a personal statement, and before final admission, an interview is requested when practical. Foreign applicants must submit proof that they have achieved a score on the TOEFL of 600 for the written exam, 213 for the computer-based exam, or 79 for internet-based scoring.

**Requirements for the Master of Science Degree.** Specific departmental requirements for the M.S. degree are a minimum of 30 semester hours, which include six hours of MBIM 600V Master's Thesis. Additional requirements include: PHYO 5143, MBIM 5023, 508V, 5051, 5003, 5201 or 5211, and PCOL 5211 and 5221 or equivalent. This program normally requires two years of study.

**Requirements for the Doctor of Philosophy Degree.** The Ph.D. program has no specific requirements for a total number of credit hours although successful completion normally requires two to three years beyond the Master of Science degree or five to six years when a student is admitted directly into the Ph.D. program from a baccalaureate program.

Course requirements are: BIOC 5013, PHYO 5143, MBIM 6104 or NBDS 5093, MBIM 5003, 5023, 5051, 5201 or 5211, PCOL 5211 and 5221 or equivalent, and two additional courses from the following: MBIM 5043, 5904, 6023, 6104. A course in biostatistics is highly recommended. Electives, the candidacy examinations, and research program are developed by the student in consultation with the major advisor and advisory committee.

## MICROBIOLOGY AND IMMUNOLOGY PROGRAMS

**Microbial Pathogenesis and Genetics.** This program is designed for students interested in the study of molecular mechanisms of pathogenesis utilized by bacteria, protozoan parasites, or viruses and manipulation of host microbial responses. Students will take the required courses as listed above and elective courses depending on their research focus.

**Immunology** This program is designed for students desiring to concentrate on the study of immunology including basic mechanisms of immunology and immunobiology, tumor immunotherapy, the effect of environmental toxicants and drugs of abuse on the immune response, immune senescence, and the role of the immune response in infectious diseases. Degree requirements are listed above. Required and elective courses will concentrate on aspects of immunology.

### Microbiology and Immunology (MBIM)

- MBIM 5003**     **Immunology (3) (II)** The fundamentals of immunology are presented with an emphasis on the cellular and molecular basis for understanding current concepts of lymphocyte activation, cytokine activities, and immune disorders. Prerequisite: consent
- MBIM 5023**     **Basic Principles of Microbiology (3) (II)** A basic understanding of bacteria and viruses is presented. Emphasis in bacteriology will be placed on physiology, replication, and gene exchange in bacteria. Virology will focus on virus replication strategies and pathogenesis. Prerequisite: consent
- MBIM 5033**     **Medical Microbiology (4) (I)** Lectures, case presentations, conferences, and laboratories consider the basic biology of pathogenic bacteria, fungi, and viruses and their role in the causation of human disease.
- MBIM 5043**     **Molecular Virology (3) (II)** Lectures and assigned readings pertaining to the biochemistry and molecular biology of viruses. Course given in fall semester of alternate years. (alternates with MBIM 5903) Prerequisite: MBIM 5023 or consent of instructor

- MBIM 5051**     **Microbiology and Immunology Seminar (1), (I, II)** Required of all students each semester. Students present the results of their thesis or dissertation research. Attendance is required, and participation is essential. Offered on a pass/no pass basis.
- MBIM 508V**     **Research in Microbiology and Immunology (1-10) (I, II, S)** Various areas of experimental microbiology and immunology can be studied under the direction of various graduate faculty members.
- MBIM 5201**     **Current Topics in Microbiology (1) (I, II)** Discussion and advanced study on selected topics of current research importance. Required all semesters for all microbiology students.
- MBIM 5211**     **Current Topics in Immunology (1)(I, II)** Discussion and advanced study on selected topics of current research importance. Required all semesters for all immunology and immunopathology students.
- MBIM 5904**     **Bacterial Genetics and Pathogenesis (4) (II)** Lectures and advanced study focusing on molecular approaches used in the study of the interactions between bacteria and humans.
- MBIM 600V**     **Master's Thesis (1-6) (I, II, S)** Prerequisite: graduate standing and consent.
- MBIM 6023**     **Molecular Mechanisms in Immunology (3) (I)** Lectures and discussion of relevant publications will cover specialized topics in immunology, emphasizing molecular aspects of function. Topics will include genetic mechanisms, signal transduction, cytokine function, and autoimmunity. Prerequisite: MBIM 5003 or consent.
- MBIM 6033**     **Networks in Immunology (3) (II)** Lectures and discussion of relevant publications will cover selected topics in immunology and immunopathology, emphasizing the complex molecular interactions in immunology in the context of disease. Topics include AIDS, neural-immune infections, multiple myeloma, and immune senescence in aging. Prerequisite: MBIM 5003 or consent.
- MBIM 6104**     **Molecular Cell Biology (4) (I)** Lectures and discussion of relevant publications which cover major processes in cell biology. Classes will emphasize the molecular models and experimental data that describe these cell processes. Topics will include: nuclear import/export, protein secretion and trafficking, endocytosis and exocytosis, cell cycle control, and signal transduction. Pre-requisite: prior course in cell biology or consent; course in biochemistry or molecular biology recommended.
- MBIM 700V**     **Doctoral Dissertation (1-10) (I, II, S)** Prerequisite: candidacy and consent
- BIOC 5103**     **Biochemistry and Molecular Biology (3) (I)** A broad presentation of basic biochemistry and molecular biology as background for other graduate programs in the biomedical field. Prerequisites: General and Organic Chemistry and College Algebra.
- NBDS 5093**     **Cell Biology (3) (I)** The structure and function of cells and cellular organelles with particular attention to how these interact in larger units of organization. Prerequisite: prior or concurrent course in Biochemistry or consent of instructor

**PHYO 5143**    **Gene Expression (3) (I)** The focus of this course will be on the various processes involved in the flow of information from genes to their expressed products. Regulation of these processes will be explored in depth for both prokaryotic and eukaryotic systems. Topics will include: Genome organization, DNA replication and recombination, transcription, RNA processing, translation, genomics and proteomics, differentiation and development. Prerequisite: consent of instructor.

## NEUROBIOLOGY AND DEVELOPMENTAL SCIENCES (NBDS)

David L. Davies, Ph.D., NBDS Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5184

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

Elie Al-Chaer, Ph.D.  
Steven W. Barger, Ph.D.  
Helen Benes, Ph.D.  
Puran S. Bora, Ph.D.  
E. Robert Burns, Ph.D.  
M. Donald Cave, Ph.D. (Emeritus)  
Gwen V. Childs, Ph.D.  
John Dornhoffer, M.D.  
Paul D. Drew, Ph.D.  
Edgar Garcia-Rill, Ph.D.  
Shirley Ann Gilmore, Ph.D. (Emeritus)  
W. Sue T. Griffin, Ph.D.  
Cynthia J. M. Kane, Ph.D.  
Angus MacKay MacNicol, Ph.D.  
Mark Mennemeier, Ph.D.  
Bruce W. Newton, Ph.D.  
John E. Pauly, Ph.D. (Emeritus)

#### PROFESSORS (continued)

Ervin W. Powell, Ph.D. (Emeritus)  
Jerome K. Sherman, Ph.D. (Emeritus)  
Robert D. Skinner, Ph.D.  
Patrick W. Tank, Ph.D.

#### ASSOCIATE PROFESSORS

Jason Y. Chang, Ph.D.  
Maxim Dobretsova, Ph.D.  
David L. Davies, Ph.D.  
Abdallah Hayar, Ph.D.  
Joann E. Kirchner, M.D.  
Kevin D. Phelan, Ph.D.

#### ASSISTANT PROFESSORS

Yuzhi Chen, Ph.D.  
Mahmoud Kiaei, Ph.D.  
Melanie MacNicol, Ph.D.

### Degrees Conferred: M.S., Ph.D. (NBDS)

**Areas of Concentration:** The two main areas of research emphasis in the Department are neuroscience, and cell and developmental biology. The faculty performs research in a number of areas that include, but are not limited to, cell and developmental biology, neuroanatomy, neuroendocrinology, neurophysiology and molecular biology.

**Prerequisites to Degree Programs.** For admission to graduate standing in the department, a student must have a bachelor's degree with a major in zoology-biology or an equivalent. In addition, a score report for the Graduate Record Examination Aptitude Test is a departmental requirement.

**Requirements for the Master of Science Degree.** The Department offers a thesis M.S. degree and a non-thesis M.S. degree. All students must take Seminar and two semesters of Scientific Communication and Ethics courses offered by the Department of Pharmacology (PCOL 5211 and PCOL 5221). The thesis M.S. requires that the student take three (3) of the eight (8) courses listed below for the Ph.D. degree. A thesis of original research must be submitted and defended. The non-thesis M.S. requires that the student take Gross Anatomy, Microscopic Anatomy, Medical Neuroscience and Biostatistics I (BIOM 5013). The non-thesis student must pass a written comprehensive examination on the coursework, write a research report and present a Departmental seminar.

**Requirements for the Doctor of Philosophy Degree.** All students must take Seminar, Research, and two semesters of Scientific Communication and Ethics courses offered by the Department of Pharmacology (PCOL 5211, PCOL 5221, PCOL 5231 or PCOL 5241). Students in either the cell and developmental biology or neuroscience area of emphasis must take a minimum of three (3) of the following courses: Microscopic Anatomy, Medical Neuroscience, Cell Biology, Cellular and Developmental Neuroscience,

Gene Expression, Basic Neuroscience, Systems Neuroscience, and Molecular Cell Biology. All students must write and successfully defend a doctoral dissertation.

### **Neurobiology and Developmental Sciences (NBDS)**

- NBDS 5014** **Gross Anatomy I (I)** Gross anatomy of the human body (back, upper extremity, thorax and lower extremity). This course uses lectures, discussion groups and supervised dissection. Prerequisite: consent of the Course Director.
- NBDS 5018** **Gross Anatomy (I, II)** Gross anatomy of the human body. Lectures, discussion groups, and supervised dissection. This course spans parts of the fall and spring semesters. Prerequisite: undergraduate biology minor and consent of the Course Director.
- NBDS 5024** **Gross Anatomy II (II)** Gross anatomy of the human body (abdomen, pelvis, and head and neck). This course uses lectures, discussion groups and supervised dissection. Prerequisite: consent of the Course Director.
- NBDS 5026** **Microscopic Anatomy (I, II)** Development, structure, and function of the tissues and organs of the human body. Lectures, study of tissue sections and computer assisted instruction. This course spans parts of the fall and spring semesters. Prerequisite: consent of the Course Director.
- NBDS 5033** **Basic Neuroscience (II)** The development, anatomy, and physiology of the brain, spinal cord, and peripheral nerves are presented. Included are the normal gross and internal morphology, pathways and functions of the nervous system. Basic principles of the nerve action potential and synapses, sensory, motor, autonomic, limbic and higher cerebral systems are addressed.
- NBDS 5035** **Medical Neuroscience (II)** Basic development, anatomy, physiology and biochemistry of the brain. Considers the gross and internal morphology, pathways and functions of the nervous system. Basic principles of the nerve action potential and synapses, and of sensory, motor, autonomic, limbic and higher systems are addressed. Applications of neurology, pharmacology, pathology, toxicology, psychology and psychiatry will be made.
- NBDS 5071** **Neurophysiology of Voluntary Movement (On demand)** An up-to-date review of neurophysiological, neurobehavioral and neuropharmacological techniques being applied to the motor system. Readings on the role of cortex, basal ganglia, cerebellum and locomotor regions will be assigned preceding each session of lecture and discussion. Discussion is graded. One written paper or an oral presentation is required from each student. Prerequisite: Medical Neuroscience (NBDS 5035) or equivalent neurophysiology or physiological psychology course.
- NBDS 5081** **Current Topics in Neurobiology (On demand)** Topics will be chosen to reflect important current research in neurophysiology, neuroanatomy and transmitter substances. Students will read original papers, review articles and make presentations for discussion. Grades will be based on presentations, participation and a written paper. Prerequisite: NBDS 5035 or permission.
- NBDS 5093** **Cell Biology (I)** The structure and function of cells and cellular organelles with particular attention to how these interact in larger units of organization. Prerequisite: course in Biochemistry.

- NBDS 5103 Cellular/Developmental Neuroscience (II)** This course consists of lectures, assigned readings and student presentations that cover the structure, function and development of cells of the nervous system, the basic principles of the physiology of excitable cells, and synaptic transmission.
- NBDS 5121 Seminar (I, II)**
- NBDS 513V Research (I, II, S)** Credits to be arranged.
- NBDS 5142 Fundamentals for Neuroscience (On demand)** This course presents the basic anatomical concepts needed for understanding more advanced neuroscience courses. This course will place the central and peripheral nervous systems into the larger anatomical framework of the human body. It will cover the neural aspects of histology, embryology, radiology, cranial nerves, body cavities, and head and neck anatomy. Prerequisite: undergraduate basic science background helpful.
- NBDS 5153 Systems Neuroscience (On demand)** In this course neurons and glial cells, neurotransmitters, and receptors are incorporated into components of the nervous system. Some of these components are the somatosensory, visual, auditory, voluntary motor, and autonomic motor systems. The course mainly explores the human nervous system but principles are applicable to a wide spectrum of animals.
- NBDS 5161 Neuronal Signals (S)** This course critically reviews advanced techniques for recording and analyzing neuronal activity such as patch clamping and imaging neuronal networks with calcium and voltage-sensitive dyes. The prerequisites are either Medical Neuroscience (NBDS 5035) or Basic Neuroscience (NBDS 5133), or laboratory experience using electrophysiology or imaging, and consent of the Course Director.
- NBDS 5203 Neurophysiology Recording Techniques (On demand)** Lectures and laboratory demonstrations will be used to introduce state-of-the-art electrophysiological recording techniques used to monitor neuronal excitability. Techniques will include: extracellular evoked field potentials and single-unit recording *in vivo*, intracellular recording in brain slices, patch clamp recording and calcium imaging *in vivo*. Prerequisites: undergraduate biology degree or permission of Course Director.
- NBDS 600V Master's Thesis (1-6) (I, II, S)** Prerequisite: graduate standing and consent.
- NBDS 6001 Current Topics in Signaling and Development (On demand)** This course explores fundamental topics in molecular development, including homeotic genes, axial patterning, signaling mechanisms in developmental decisions, mesoderm induction, limb development apoptosis and disease pathologies. The course takes the form of student discussion of current papers from the literature.
- NBDS 6103 Human Development (On demand)** This course explores the processes of human development, including gametogenesis, fertilization, embryogenesis, organogenesis, and fetal growth. Discussions include specialized development of organ systems, congenital malformations, teratogenesis and principles of development. Prerequisites: consent of the Course Director.
- NBDS 700V Doctoral Dissertation (1-10) (I, II, S)** Prerequisite: candidacy and consent.

- MBIM 6104** **Molecular Cell Biology** Lectures and discussion of relevant publications, which cover major processes in cell biology. Classes will emphasize the molecular models and experimental data that describe these cell processes. Topics will include: nuclear import/export, protein secretion and trafficking, endocytosis and exocytosis, cell cycle control and signal transduction. Pre-requisite: prior course in cell biology or consent; course in biochemistry or molecular biology recommended.
- PHYO 5033** **Cellular Endocrinology** Covers general or vertebrate endocrinology, both anatomical and physiological, with lectures and laboratory exercises each week. In addition, students will prepare a term paper on a selected area in the field. Prerequisite: PHYO 500V and consent of the Course Director.
- PHYO 5143** **Gene Expression** The focus of this course will be on the various processes involved in the flow of information from genes to their expressed products. Regulation of these processes will be explored in depth for both prokaryotic and eukaryotic systems. Topics will include: Genome organization, DNA replication and recombination, transcription, RNA processing, translation, genomics and proteomics, differentiation and development. Prerequisite: consent of the Course Director.

# DOCTOR OF PHILOSOPHY IN NURSING (NPHD)

**Elaine Souder, Ph.D.**, NPHD Graduate Program Director  
UAMS, 4301 West Markham, Little Rock, Arkansas 72205, 501-296-1893

## The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

### PROFESSORS

**Claudia Barone, Ed.D.**  
**Cornelia Beck, Ph.D.**  
**Claudia Beverly, Ph.D.**  
**Elizabeth Ann Coleman, Ph.D.**  
**Robert Kennedy, Ph.D.**  
**Jean McSweeney, Ph.D.**  
**Elaine Souder, Ph.D.**

### ASSOCIATE PROFESSORS

**Angela Green, Ph.D.**  
**Mary Hartwig, Ph.D.**  
**Donna Gullette, DSN**  
**Donna Middaugh, Ph.D.**

### ASSOCIATE PROFESSORS (continued)

**Cheryl Schmidt, Ph.D.**  
**Sunghee Tak, Ph.D.**  
**Pao Feng Tsai, Ph.D.**

### ASSISTANT PROFESSORS

**Julia A. Goodwin, Ph.D.**  
**Seongkum Heo, PhD**  
**Leanne Lefler, PhD**  
**Carmen Paniagua, Ed.D.**

## Degrees Conferred: Ph.D.

The Doctor of Philosophy (Ph.D.) in Nursing program will prepare nurses to advance the art and science of nursing through research and scholarship. Graduates are expected to assume leadership positions in academic and health care settings and to influence nursing practice, health care delivery, and the social awareness of nursing's contributions to health care. Selected course work and educational activities are designed to help students develop knowledge in a specialized nursing area, develop and test theories, and acquire the skills and experience for conducting research that is relevant to their area of interest. The learning is directed by a cadre of faculty with funded research and is facilitated by required and elective course work, independent study, and research activities.

**Prerequisites for the Doctor of Philosophy Degree Program** Graduate School and College of Nursing completed application forms and all required transcripts and other documents must be received by the College of Nursing Registrar's office by **January 2** each year. In addition to the general requirements for admission to the University of Arkansas for Medical Sciences Graduate School, applicants for doctoral study must meet the following requirements:

1. Hold current unencumbered licensure as a registered nurse.
2. Hold a master's degree in nursing from an NLN or CCNE accredited program and show documentation of a minimum GPA of 3.65 in all course work for the master's degree. (Applicants desiring admission with only a B.S.N. or with a master's degree in another field will be considered. If admitted, these students will be required to complete M.N.Sc. prerequisite course work in nursing.)
3. Present a Graduate Record Examination (GRE) score of at least 1100 total on the verbal and quantitative scales, with a minimum score of 450 for each, taken within the last 5 years.
4. Evidence of TB skin test and completed Hepatitis B series on file with the College of Nursing before registering for any graduate nursing courses.

5. Written response to questions regarding educational goals, research interests, and desired research career.
6. Example of scholarly written work.
7. Written essay on a selected topic at the time of interview.
8. Interview with graduate faculty members.
9. The applicant whose native language is not English must present a minimum score of 550 on the paper-based or 213 on the computer-based TOEFL taken within 2 years immediately preceding the requested semester of admission.

**Requirements for the Doctor of Philosophy Degree** The curriculum leading to the Doctor of Philosophy in Nursing can be completed through a full-time or part-time program of study; however, full-time study is highly encouraged.

The purpose of the program is to prepare nurse researchers for faculty, administrative, advanced clinical and leadership positions in Arkansas. The goals of the program are realized through the following program objectives:

Upon completion of the Ph.D. in Nursing, the graduate will be able to:

1. Develop theoretical systems and empirical explanation of phenomena related to nursing.
2. Synthesize knowledge from nursing and other disciplines as a basis for generating and augmenting nursing knowledge.
3. Use methods of systematic inquiry and implement a research program that addresses processes germane to client outcomes.
4. Provide leadership to positively influence the discipline of nursing.

Using the knowledge and skills learned in the Ph.D. Nursing program, the mission and the goals of our program are evident in the accomplishments of our graduates.

The program consists of a minimum of 60 semester hours of course work beyond the master's degree, including 18 semester hours of doctoral dissertation.

- I. **Scientific Perspective** (9 semester hours)
  - Theory in Science
  - Theoretical Systems and Nursing Research
  - Issues Influencing Research
- II. **Research Tools** (17 semester hours)
  - Qualitative Methodology in Nursing Research
  - Quantitative Methodology in Nursing Research
  - Data Management and Analysis I
  - Data Management and Analysis II
  - Epidemiology
- III. **Support Courses** (10 semester hours)
  - Leadership in Health Care Systems
  - Leadership in Health Care Systems: Fieldwork
  - Electives
- IV. **Research Experience** (24 semester hours)
  - Synthesizing the Literature
  - Preliminary Studies and Grant Development
  - Dissertation

## DOCTOR OF PHILOSOPHY (NUSC)

The courses of instruction to be offered in the Doctor of Philosophy degree program are described on the following pages. An enrollment of at least 5 students is required for course implementation.

1. The first digit on the left indicates the course level. Courses with a left-hand digit of 6 are open to graduate students.
2. The fourth digit indicates semester credit hours.

- NUSC 6103**     **Theory in Science** Examines the nature of scientific explanation and theoretical development. The historical and philosophical bases of sciences, strategies for theory development, and the use of theory in the evolution of nursing as a discipline are analyzed. Prerequisite: Consent.
- NUSC 6113**     **Theoretical Systems in Nursing Research** Analyzes the relationship of theoretical systems to nursing research. The application of theoretical systems to nursing and strategies for using them in research are evaluated. Pre or co-requisite: NUSC 6103 or consent.
- NUSC 6123**     **Issues Influencing Research** Examines the professional, financial, sociopolitical, ethical, and legal issues that affect the conduct of nursing research. The role of health policy and funding priorities in developing a program of nursing research are examined. Prerequisite: Consent.
- NUSC 6233**     **Qualitative Methodology in Nursing Research** Examines the philosophical foundation for and methodological issues in using qualitative approaches for scientific inquiry and knowledge development. Strategies for enhancing scientific and methodological rigor are explored. Pre or co-requisite: NUSC 6103 and NUSC 6243, or consent.
- NUSC 6243**     **Quantitative Methodology in Nursing Research** Examines the philosophical foundation for and characteristics of designs and methods associated with quantitative approaches to scientific inquiry and knowledge development. Characteristics of effective design and methods, and strategies for enhancing the scientific and methodological rigor are explored. Pre or co-requisite: NUSC 6103 and NUSC 6254, or consent.
- NUSC 6254**     **Data Management and Analysis I** Examines approaches to reducing, managing, and analyzing data for primary and secondary analysis. Coding data, designing data entry systems, interfacing with major statistical software packages, and coordinating mainframe and microcomputer software are discussed. Prerequisite: Consent.
- NUSC 6264**     **Data Management and Analysis II** Evaluates inferential statistics appropriate for analysis of data from non-experimental, quasi-experimental, and experimental designs and examines the uses, conceptual issues, mathematical formulations, and limitations of empirical and non-empirical methods used in analysis and synthesis of complex data sets. **NUSC6254 or consent.**
- NUSC 6283**     **Qualitative Data Analysis Theory and Practicum** Course examines approaches to collecting, reducing, managing and analyzing qualitative software packages used in data management. The practicum portion of the course includes practice sessions for interviewing, coding data, establishing inter-rater agreement and development themes. **Pre-or Co-requisite: NUSC 6243 and NUSC 6233, or consent (for interdisciplinary students).**

- NUSC 6323**     **Synthesizing the Literature** Develop the skills to synthesize the literature in clinical nursing research. Prerequisites for this course include the following courses: NUSC6103, NUSC6113, NUSC6213, NUSC6243, NUSC6253, and NUSC6263, or permission of the instructor. This course may also be available by Internet in some semesters.
- NUSC 6333**     **Preliminary Studies and Grant Development** Develop skills needed to conduct preliminary pilot studies and prepare a grant proposal. Prerequisites : NUSC6103, NUSC6113, NUSC6243, NUSC6254, NUSC 6264, NUSC6233, and NUSC6323, or consent.
- NUSC 6371**     **Leadership in Healthcare Systems Field Experience** This course invites students to engage in a leadership/policy related experience. Students will choose a topic and respective client that will be used for a policy analysis exercise. This course should be taken within one to two semesters following NUSC 6373: Leadership in Healthcare Systems. This is a field-based experiential course. Prerequisite: NUSC 6373:
- NUSC 6373**     **Leadership in Healthcare Systems** Examines the theoretical underpinning of leadership knowledge, principles, skills, and competencies needed to lead interprofessional teams and health care system change to improve the health of society. This course provides students with an overview of the U. S. health care system and the financing and organization of health care. Steps used in the policy process will be discussed. Prerequisite: Consent.
- NUSC 604V**     **Topics in Nursing: (1-6)** Discussion and advanced study on selected topics not covered in general courses. May repeat up to a maximum of 6 credit hours. Prerequisite: Consent.
- NUSC 605V**     **Independent Study: (1-6)** Provides opportunity to pursue study to meet individual student needs. May repeat to a maximum of 6 credit hours. Prerequisite: Consent.
- NUSC 700(V)**     **Doctoral Dissertation: (1-10)** Prerequisite: Candidacy and consent.

## Doctor of Philosophy in Nursing BSN to PhD

### Entry into the PhD Program with BSN\*

The BSN to PhD program is designed to prepare the applicant for a nursing career as either an educator, a researcher, an administrator, or a clinician. It is not designed to prepare a certified nurse practitioner or clinical nurse specialist. Students entering this program receive a PhD nursing degree; **the BSN student completing the PhD degree in nursing does not earn a master's degree.** Students wishing to earn a master's degree must first enter the master's program and complete the requirements before applying to the PhD program.

Admission: The applicant with a BSN will need to meet all the admission requirements for the PhD program and must have 1000 hours of documented clinical nursing practice before enrolling in any clinical course. In addition, an applicant will need approval from the master's specialty coordinator of the applicant's chosen clinical, administrative, or nursing education specialty.

Program of Study: The program of study for a person entering the BSN to PhD program will include a minimum of 81 credit hours. The program of study will include all the core courses for the doctoral program, 6 hours of electives, and 18 hours of dissertation study. In addition, the student must select a clinical, administrative, or nursing education specialty at the master's level. The credit hours required for completing vary depending on the selected specialty. The specialty areas are Adult Acute Care Nurse Practitioner or CNS, Family Nurse Practitioner, Family Psychiatric Mental Health Nurse Practitioner, Pediatric Nurse Practitioner or CNS, Women's Health Nurse Practitioner, Nursing Administration, and Nursing Education. Those selecting nursing education must also have co-acceptance in another master's specialty. Taking the BSN entry pathway into the PhD program will shorten the student's program of study for the PhD degree by approximately 20 credit hours.

\* Also applicable to individuals with non-nursing master's degree.

### Requirements for BSN to PhD: **Clinical Specialization**

NUSC 5023: Research Utilization in Advanced Nursing Practice
NUSC 5033: Advanced Physiology and Pathophysiology
NUSC 5043: Clinical Pharmacology & Therapeutics in Advanced Nursing Practice
NUSC 5201 and NUSC 5222: Advanced Health Assessment and Diagnostic Reasoning Practicum and Theory
<b>Clinical Theory &amp; Practicum Courses as required by the specialty</b>
NUSC 6103: Theory in Science
NUSC 6113: Theoretical Systems and Nursing Research
NUSC 6123: Issues Influencing Research
NUSC 6233: Qualitative Methodology in Nursing Research
NUSC 6243: Quantitative Methodology in Nursing Research
NUSC 6254: Data Management and Analysis I
NUSC 6264: Data Management and Analysis II
NUSC 6373: Leadership in Health Care Systems
NUSC 6371: Leadership in Healthcare Systems – Field Experience
NUSC 6323: Synthesizing the Literature
NUSC 6333: Preliminary Studies and Grant Development
NUSC 5173: Quantitative Epidemiology
<b>Electives 6 hours</b>
<b>Dissertation 18 hours</b>
<b>Minimum Credit Hours:</b> variable depending on clinical specialty

Requirements for BSN to PhD: **Administration Specialization**

NUSC 5023: Research Utilization in Advanced Nursing Practice
NUSC 5083: Technology in Adult Education
NUSC 5703 Organizational Behavior in Nursing
NUSC 5723: Nursing Informatics
NUSC 5743 Personnel Management in Nursing
NUSC 5753 Law, Policy & Procedure in Healthcare
NUSC 5773: Financial Management in Nursing
NUSC 5173: Quantitative Epidemiology I
NUSC 6103: Theory In Science
NUSC 6113: Theoretical Systems and Nursing Research
NUSC 6123: Issues Influencing Research
NUSC 6233: Qualitative Methodology in Nursing Research
NUSC 6243: Quantitative Methodology in Nursing Research
NUSC 6254: Data Management and Analysis I
NUSC 6264: Data Management and Analysis II
NUSC 6371: Leadership in Healthcare Systems – Field Experience
NUSC 6373: Leadership in Healthcare Systems
NUSC 6323: Synthesizing the Literature
NUSC 6333: Preliminary Studies and Grant Development
<b>Electives 6 hours</b>
<b>Dissertation 18 hours</b>
<b>Minimum Credit Hours 81</b>

Requirements for BSN to PhD: **Nursing Education Specialization.**

This program of study requires either a **clinical** or an **administration specialization** AND completion of the following courses:

Specialization courses (clinical or administrative)
NUSC 5023: Research Utilization in Advanced Nursing Practice
NUSC 5063: Theoretical Foundations of Nursing Education
NUSC 5073: Nursing Education Practicum
NUSC 5083: Technology in Adult Education
NUSC 5093: Technology Practicum
NUSC 6103: Theory in Science
NUSC 6113: Theoretical Systems and Nursing Research
NUSC 6123: Issues Influencing Research
NUSC 6233: Qualitative Methodology in Nursing Research
NUSC 6243: Quantitative Methodology in Nursing Research
NUSC 6254: Data Management and Analysis I
NUSC 6264: Data Management and Analysis II
NUSC 6371: Leadership in Healthcare Systems – Field Experience
NUSC 6373: Leadership in Healthcare Systems
NUSC 6323: Synthesizing the Literature
NUSC 6333: Preliminary Studies and Grant Development
Electives 6 hours
Dissertation 18 hours
<b>Minimum Credit Hours: variable depending on clinical specialization</b>

# OCCUPATIONAL AND ENVIRONMENTAL HEALTH (OEHM)

**Jay Gandy, Ph.D.**, OEHM Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-526-6663

## The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

### PROFESSORS

**Morris F. Cranmer, Ph.D.**  
**Jay Gandy, Ph.D.**  
**Jack A. Hinson, Ph.D.**  
**Nicholas Lang, Ph.D.**

### ASSISTANT PROFESSORS

**Alesia C. Ferguson, Ph.D.**  
**Susan A. Kadlubar, Ph.D.**  
**Thomas W. Rimmer, Sc.D., CIH**

### NON-UAMS GRADUATE FACULTY

**William T. Allaben, Ph.D. (NCTR)**  
**Glenn C. Millner, Ph.D. (Center for Toxicology and Environmental Health)**  
**Jeffrey Moran, Ph.D. (Arkansas Department of Health)**  
**Paul Nony, Ph.D. (NCTR)**  
**Alan C. Nye, Ph.D. (NCTR)**

## Degree Conferred: M.S. (OEHM), Certificate in Occupational and Environmental Health

The Master of Science in Occupational and Environmental Health is designed to train students and health professionals in the recognition, evaluation, and control of health hazards encountered in the occupational and community environment and to provide educational opportunities to physicians and nurses seeking a career in occupational and environmental medicine. The full range of possible hazardous agents is covered, including chemical, biological, physical, and ergonomic risk factors. The program is intended for students from a wide variety of backgrounds including biology, chemistry, physics, engineering, environmental science, and nursing. The program is tailored for professionals already working in the occupational health field to further their education while continuing to work, as well as for full or part-time students new to the field. The master's thesis project may be based on either a laboratory research project or a field experience in which the student will have the opportunity to study the evaluation and control of specific health hazards in an actual community or workplace setting.

The Certificate in Occupational and Environmental Health provides preparation in the core elements of environmental and occupational hygiene and will provide practical knowledge and tools that can be immediately applied in industrial, manufacturing, hospital, and construction settings. This graduate certificate will enhance the individual's ability to recognize, identify, measure, and control chemical, physical and biological hazards. The American Board of Industrial Hygiene (ABIH) requires, in addition to a bachelors degree in science and appropriate experience, 12 credit hours in industrial hygiene related coursework for certification as a Certified Industrial Hygienist (CIH). This graduate certificate will allow occupational health professionals to meet that 12 credit requirement, should they plan to obtain a CIH through ABIH. All 12 credit hours acquired during the graduate certificate program can be directly applied to the Master of Science in Occupational and Environmental Health and up to 6 credit hours can be applied to the Master of Public Health program.

### **Prerequisites to Master of Science Degree Program.**

Applicants should have an undergraduate grade point average of 3.00 or higher and above average scores on the Graduate Record Examination. Prerequisite coursework should include satisfactory completion of undergraduate courses in mathematics, chemistry (general and organic), physics and biology. On occasion, certain requirements can be completed after admission to the program for an otherwise outstanding student.

### **Prerequisites to the Certificate in Occupational and Environmental Health program.**

Students entering this graduate certificate program are required to have a bachelor's degree with basic math and science coursework acceptable to the program faculty.

### **Requirements for the Master of Science Degree.**

For a Master of Science Degree in Occupational and Environmental Health, required courses include Environmental and Occupational Health, Biostatistics I, Principles of Toxicology in Public Health, Environmental Exposure Assessment, Epidemiology I, Regulation of Environmental Health, Occupational and Environmental Hazard Control, and the Professional Communications and Ethics Seminar. In addition, students must register for six thesis hours, and an acceptable thesis based on relevant field experience or independent investigative research is required. Additional approved courses in public health, toxicology, pharmacology, instrumentation or other basic sciences may be taken as electives to fulfill the 36 credit hour degree requirement.

### **Requirements for the Certificate in Occupational and Environmental Health.**

Successful completion of twelve hours of coursework is required, as described below:

Section 1: Students are required to take each of the following classes:

- Environmental and Occupational Health (OEHM 5023)
- Environmental Exposure Assessment (OEHM 5263)

Section 2: Students may select either one or both of the following courses:

- Principles of Toxicology in Public Health (OEHM 5063)
- Occupational and Environmental Hazard Control (OEHM 5043)

Section 3: Students must select one of the following if only one course was selected from Section 2:

- Government Regulation of Environmental Health (OEHM 5073)
- Environmental and Industrial Biological Hazards (OEHM 5153)

## **Occupational and Environmental Health (OEHM)**

- OEHM 5023 Environmental and Occupational Health (I, S)** A detailed overview of environmental and occupational health science, with an emphasis on the recognition, evaluation and control of chemical, physical, and biological hazards. Additional topics include significant legal and historical influences as well as currently important issues in the fields.
- OEHM 5043 Occupational and Environmental Hazard Control (I)** Detailed study of the principles and practices involved in the control of environmental health hazards, with particular attention to occupational hazards. Topics covered will include ventilation for airborne contaminants, respiratory protection, electrical and mechanical safety methods, and the control of noise, vibration, radiation, heat, biohazards, and chemical hazards.
- OEHM 5051 Professional Communication and Ethics (On Demand)** An overview of the process of developing investigation questions, methods, evaluations, and publications. Also, various faculty will lead discussions concerning ethical conduct related to professional practice, scientific publishing, and research. An oral presentation reviewing recent peer-reviewed research on a topic of interest to the student will be required.
- OEHM 5063 Principles of Toxicology in Public Health (II)** Detailed study of the science and methods of toxicology as applied to adverse health effects from toxicants in the environment, community and workplace with an emphasis on dose-response relationships. Includes cancer, adverse reproductive outcomes, endocrine disruptors, and specific organ toxicants along with examples of regulatory applications. Prerequisites: PBHL5113/OEHM 5023.

- OEHM 5073 Regulation of Environmental Health (I)** An up-to-date overview of the operational and statutory basis for and aspects of governmental regulation of environmental hazards to public health. Focuses on the relationships that exist between scientific aspects of environmental and occupational health and their application through the statutory framework and related governmental regulations in the public health arena. (Same as INTX 5073.)
- OEHM 5083 Environmental and Occupational Health Policy (S)** This course is designed to stimulate critical thinking about environmental and occupational health risk management, including policy effectiveness, efficiency, and fairness. Alternatives to traditional means of regulating environmental hazards will be explored, along with issues regarding environmental justice and ethics and the role of participation by affected groups. Prerequisites: PBHL 5113 or OEHM 5023 or equivalent and consent of course director
- OEHM 509V Advanced Toxicology (1-5) (I,II)** This advanced course will be a modular course consisting of several interdisciplinary areas. Those areas of study include developmental, occupational, and environmental toxicology. Will provide students with in-depth information concerning the use of basic medical sciences to assess chemical and drug-induced toxicity and to evaluate public health problems. (Same as INTX 509V.) Prerequisite: OEHM 5023
- OEHM 511V Special Topics in Occupational and Environmental Health (1-3)** Gives in-depth treatment to topics of current importance and to specialized subjects not covered in general courses. Each topic will be a narrowly defined aspect of occupational or environmental health.
- OEHM 5153 Environmental and Industrial Biological Hazards (On Demand)** This course focuses on the cause and consequences of Biohazard derived disease and conditions in Arkansas. Lectures and materials emphasize recognition, avoidance and control. Over six hundred biohazards (mold, bacteria, virus, prions, parasites, toxins, allergens, carcinogens) frequently cause diseases and complaints in the general population. There are at least two hundred important occupational biohazards that produce infections, allergies and chronic disease such as cancer. Bacterial, viral and parasitic diseases, previously limited to the developing world are being identified with increasing frequency in the poor and disadvantaged in the rural South and states along the U.S.-Mexico border.
- OEHM 5263 Environmental Exposure Assessment (I)** Quantitative introduction to the process of environmental exposure dose evaluation for inhalation, ingestion, and dermal absorption routes. Particular attention is given to air contaminant measurement principles and interpretation of monitoring results. Includes assessment and modeling of workplace, community, and residential environments and the associated sources and pathways of chemical exposure.
- OEHM 600V Master's Thesis (1-6) (I,II,S)** Prerequisite: graduate standing and consent.
- BIOM 5013 Biostatistics I** Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, non-parametric tests, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments. Prerequisite, consent.
- BIOM 5173 Epidemiology I** An introduction to epidemiology and the basic principles and methods of epidemiological research and practice. Overview of the history and the theoretical basis of epidemiology; measures of morbidity, mortality, disease transmission and risk; major study designs; measures of association; bias, confounding and interaction; evaluation of screening tests; inference; casualty.

**PCOL 5033** **General Principles of Pharmacology and Toxicology (I)** This course offers an overview of the principles and general mechanisms underlying the effects of drugs and chemicals on biological systems. The application of these principles to proper experimental design is also considered.

## PHARMACEUTICAL SCIENCES (PHSC)

**Kim E. Light, Ph.D., PHSC Graduate Program Director**  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5557

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

Paula Anderson, M.D.  
E. Kim Fifer, Ph.D.  
Paul O. Gubbins, PharmD.  
Bill J. Gurley, Ph.D.  
Kim E. Light, Ph.D.  
Bradley, C. Martin, PharmD, Ph.D.  
Larry D. Milne, Ph.D.  
Cherng-ju Kim, Ph.D.  
Cesar M. Compadre, Ph.D.  
S. Jessie Liu, Ph.D.  
Grazyna Nowak, Ph.D.  
Martin Hauer-Jensen, MD, PhD  
Nicki L. Hilliard, PharmD. M.S.  
Daohong Zhou, M.D.  
Jonathan J. Wolfe, Ph.D.

#### ASSOCIATE PROFESSORS

Phillip J. Breen, Ph.D.  
R. Lilia Lopez-Becerra, Ph.D.  
Dwight Pierce, Ph.D.

#### ASSISTANT PROFESSORS

Marjan Boerma, Ph.D.  
Mark Helm, Ph.D.  
Teresa Hudson, PharmD  
Chenghui Li, Ph.D.  
Qayyim Said, Ph.D.  
Nalin Payakachat, Ph.D.  
Snehalata Pawar, Ph.D.  
Elvin Price, Ph.D.  
Howard Hendrickson, Ph.D.

#### NON-UAMS GRADUATE FACULTY

Jerry A. Darsey, Ph.D. (UALR)  
Shirley W. Gray, M.A. (UAMS WPRCI)  
Rena A. Sheffer, M.L.S. (UAMS Associate Librarian)  
Weida Tong, Ph.D. (NCTR)

### Degree Conferred: M.S. (PHSC)

**Objectives** The Pharmaceutical Sciences Program attracts students from a variety of backgrounds including biology, chemistry, biochemistry, pharmacy, and other related areas. The program provides an excellent educational and research experience in the Pharmaceutical Sciences. The individual student's program will emphasize a variety of areas including: medicinal/natural product chemistry, pharmacology/toxicology, pharmaceutical analysis, and pharmaceutical evaluation and policy.

To fulfill requirements for the M.S. degree, a student must satisfactorily complete the required course work (see "*Curriculum for the M.S. Graduate Program in Pharmaceutical Sciences*"), complete a written thesis based on his/her research, and pass the Final Examination (thesis defense).

The Pharmaceutical Sciences program is patterned on the highest standards, taking into consideration academic training as well as research. The faculty of the program has had wide experience in research, as well as having held appointments with many of the leading graduate schools of the nation. Some, also, are serving or have served in industry as specialized consultants in research assignments in the medicinal aspects of drugs and pharmaceuticals.

## Requirements for admission to graduate standing in the Pharmaceutical Sciences

Applicants desiring admission must possess a bachelor's degree in the physical or biological sciences, (such as an undergraduate or professional degree in biology, chemistry, or pharmacy) **or** a bachelor's degree in health sciences, or in an allied field from an accredited American college or from a foreign university whose accreditation requirements are comparable to those of accredited American colleges or universities.

In addition to the documents and requirements for admission to the Graduate School of the University of Arkansas for Medical Sciences, the Pharmaceutical Sciences Program requires the following items:

- 1) Satisfactory performance on the Graduate Record Examination. The office that administers the examination must submit official scores.
- 2) Letter from the applicant describing career goals and the **area of interest within the Pharmaceutical Sciences.**
- 3) Three letters of recommendation from individuals who are familiar with the applicant's scientific, academic, and personal capabilities.
- 4) Graduate Committee interview (if possible).

## Requirements for the Master of Science Degree.

A minimum of 30 semester hours of graduate study is required for the master's degree. Of this amount, 24 semester hours are given to didactic instruction, and six hours are given to thesis. The 24 semester hours of didactic instruction consists of a minimum of 12 hours in the major field of study.

## Pharmaceutical Sciences (PHSC)

- PHSC 5013 Medicinal Chemistry for Graduate Students** This course provides an overview of the fundamental principles of medicinal chemistry. Emphasis is placed on physicochemical properties of organic molecules as they apply to the design and action of medicinal chemical agents.
- PHSC 5033 Pharmaceutics for Graduate Students** The primary objective of this course is to provide an overview of the discipline of pharmaceutics (the study of drug delivery systems) for graduate students. Particular emphasis is placed on physico-chemical properties of drugs and dosage forms, both *ex vivo* and *in vivo*, that are important for basic research in the fields of the pharmaceutical sciences.
- PHSC 5041 Pharmaceutical Science Seminar** Members of faculty and graduate students meet regularly for discussion and current studies in the field of the pharmaceutical sciences.
- PHSC 5053 Methods in Pharmaceutical Sciences** This course presents an overview of pharmaceutical science methods. Three main aspects are covered. The initial section discusses the development of a testable hypothesis, design of the experiment, and interpretation of results. The second section covers general laboratory procedures and safety issues. The third section covers several current model systems and their application to specific research questions. Prerequisites are graduate standing or the consent of the instructor.
- PHSC 5062 Scientific/Technical Writing** This course provides graduate students with the opportunity to develop skills necessary for managing scientific information and communicating this information in writing to others. Students will analyze and draft writing projects centered on abstracts, articles and proposals/grants. These projects will be drawn from the individual student's area of interest or that of the laboratory in which they are working. The course will be taught by structured presentations and individualized writing critique and graded on a pass / no-pass basis.

- PHSC 5143**     **Molecular Modeling** Molecular modeling is an introduction to the computational techniques used to understand chemical structure, reactivity and the relationship between structure and biological function. The class will meet for two hours of lectures, and one laboratory session every week. During the laboratory sessions the students will use advanced graphics workstations.
- PHSC 5162**     **Scientific Literature Retrieval** Survey of scientific literature, particularly of the biological and chemical sciences, and the use of general and specific index and abstract tools in science, including search strategy and computer-based retrieval programs. Credit, 2 hours. Two lectures per week. Prerequisite: consent of instructor.
- PHSC 517V**     **Advanced Biopharmaceutics and Pharmacokinetics (2-3)** Quantitative treatment of the dynamics of drug absorption, distribution and excretion including the development of mathematical models for these processes and their clinical applications. Prerequisite: graduate standing and consent of instructor.
- PHSC 5192**     **Pharmacokinetic Research Design and Data Analysis** Review of current methods used in the design of pharmacokinetic investigations in animals and man, and of techniques used for analysis of pharmacokinetic data. Emphasis will be placed on advantages of various mathematical techniques for data analysis, the ethics and logistics of pharmacokinetic study design, and methods used to present pharmacokinetic data. Prerequisite: graduate standing and consent of instructor, and PHSC 517V or PCOL 502V.
- PHSC 5253**     **Responsible Research** This course will explore the philosophies, rules, regulations and social structure of a responsible research environment. Emphasis will be on faculty culture, professionalism, federal regulation, ethical use of humans and animals, conflicts of interest, scientific misconduct, and the overall regulatory, normative and cognitive structures of a responsible research environment.
- PHSC 526V**     **Special Problems in the Pharmaceutical Sciences (1-4)** Individual investigation, other than thesis, of a special problem elected or assigned. Hours and credit to be arranged.
- PHSC 527V**     **Research in Pharmaceutical Sciences (1-9)** Hours and credit to be arranged. Prerequisite: graduate standing and consent of major advisor.
- PHSC 5313**     **Pharmaceutical Policy in the Healthcare System (3)** The course provides an overview of pharmaceutical policies and their effect on the health care system. The focus is on pharmaceutical issues as they impact consumers, health professionals, and organizations. Areas covered include pharmaceutical trends, industry, managed care, drug policies, drug-related behaviors and outcomes. Permission of instructor required to register.
- PHSC 5323**     **Foundations of Pharm Eval and Policy Res Methods (3)** The purpose of this course is to provide students with the introductory skills to become a researcher in Pharmaceutical Evaluation and Policy. The student will be exposed to a wide range of topics including sources for funding for research, identifying research problems and writing study objectives, disseminating research, study measures, and study design.
- PHSC 5333**     **Social Behavioral Theory in Pharmacy (3)** Overview of theoretical perspectives in understanding behavior in the medication use process at the individual, interpersonal, and community level. The course will focus on increasing skills in describing, applying, and integrating behavioral theories in the design and evaluation of interventions to improve medication use in society.

- PHSC 5343 Applied Research Methods Using Retrospective Data (3)** This course will outfit students with the skills necessary to analyze and conduct studies using retrospective health care data with a focus on large administrative claims data such as Medicaid and private payer insurance claims. Students will use SAS to analyze actual health care data. Instruction on study design, statistical techniques, and data integrity issues specific to observational studies using these data sources will be offered.
- PHSC 5353 Pharmacoeconomics and Health Technology Assessment (3)** The purpose of this course is to provide students with the skills to design, conduct, analyze and rate investigations that assess the value or outcomes of health care technologies with a focus on pharmacy related products and services. The course will also integrate the theoretical prefaces to health care technology assessment as well as provide real world applications using decision modeling software to conduct cost effectiveness and other related studies.
- PHSC 5363 Pharmaceutical Economics and Policy Evaluation (3)** This course provides an understanding of pharmaceutical product markets and institutions from an economic perspective. Principles of economic theory are used to analyze the nature of demand and supply of pharmaceutical products, market structure of pharmaceutical industry, welfare implications, R&D and innovation, marketing, pricing, public policy, and government regulation.
- PHSC 5373 US Healthcare System (3)** This course provides an overview of major components of the U.S. healthcare sector and addresses key challenges in financing and delivery of healthcare services. Topics include healthcare expenditures, quality, access, managed care, Medicare, Medicaid, health behavior, measurement of health, public health, pharmaceutical benefit management, health care reform, and asymmetric information.
- PHSC 5383 Applied Health Econometrics** This course is designed to provide students with training in health econometrics techniques applicable to health care data. This course starts with basic econometrics theory, followed by discussions of selected econometric techniques that are commonly used in health economics. The course emphasizes application of these techniques and uses primarily Stata. Introduction to Stata is provided.
- PHSC 5393 Patient-Reported Outcomes Measures** This course will provide graduate students a solid grounding in patient reported outcomes (PROs) and health-related quality of life (HRQL) concepts and how to measure them. Materials will cover PRO instrument development, including psychometric and utility theory. The course will provide students hands on experience with statistical analyses and psychometric testing using SAS. It will cover how to select appropriate PRO instruments for clinical studies to comply with governmental regulatory guidance. The course also offers students opportunities to assess and evaluate literature involved with HRQL information and PRO instruments in specific diseases/conditions as well. Prerequisite: PHSC 5323
- PHSC 600V Master's Thesis (1-9)** Prerequisite: graduate standing and consent.

## PHARMACOLOGY (PCOL)

**Paul E. Gottschall, Ph.D.**, PCOL Graduate Program Director  
UAMS, 4301 W. Markham, Little Rock, Arkansas 72205, 501-686-5510

### The Faculty

Research interests of the faculty may be viewed through the program link at the Graduate School website, [www.uams.edu/gradschool](http://www.uams.edu/gradschool)

#### PROFESSORS

Alexei Basnakian, M.D., Ph.D.  
John P. Crow, Ph.D.  
William E. Fantegrossi, Ph.D.  
Kim Fifer, Ph.D.  
Jay Gandy, Ph.D.  
William B. Gentry, M.D.  
Paul E. Gottschall, Ph.D.  
Jack A. Hinson, Ph.D.  
Laura P. James, M.D.  
Kim E. Light, Ph.D.  
S. Jessie Liu, Ph.D.  
Lee Ann MacMillan-Crow, Ph.D.  
James D. Marsh, M.D.  
Philip R. Mayeux, Ph.D.  
S. Michael Owens, Ph.D.  
Philip Palade, Ph.D.  
Steven Post, Ph.D.  
Robert Reis, Ph.D.  
Martin J. J. Ronis, Ph.D.  
Nancy J. Rusch, Ph.D.  
Joseph R. Stimers, Ph.D.  
Galen R. Wenger, Ph.D.  
Piotr Zimniak, Ph.D.

#### ASSOCIATE PROFESSORS

Kathleen Gilbert, Ph.D.  
Paul L. Prather, Ph.D.  
Henry Simmons, M.D., Ph.D.  
William D. Wessinger, Ph.D.  
Fang Zheng, Ph.D.

#### ASSISTANT PROFESSORS

Lawrence Carter, Ph.D.  
Eric C. Peterson, Ph.D.  
Sung W. Rhee, Ph.D.

#### NON-UAMS GRADUATE FACULTY

Carl E. Cerniglia, Ph.D. (NCTR)  
Barry K. Delclos, Ph.D. (NCTR)  
Peter P. Fu, Ph.D. (NCTR)  
Phillip T. Goad, Ph.D. (NCTR)  
Deborah K. Hansen, Ph.D. (NCTR)  
Robert Heflich, Ph.D. (NCTR)  
Julian E. Leakey, Ph.D. (NCTR)  
Glen C. Milner, Ph.D. (NCTR)  
Alan C. Nye, Ph.D. (NCTR)  
Tucker Patterson, Ph.D. (NCTR)  
Merle G. Paule, Ph.D. (NCTR)  
Igor Pogribny, Ph.D. (NCTR)  
William Slikker, Jr., Ph.D. (NCTR)

### Degrees Conferred: Ph.D. (PCOL)

Students receiving a Ph.D. in Pharmacology from the UAMS College of Medicine will have received training in both the academics of pharmacology, and extensive training in the laboratory sufficient to be an independent researcher. Most graduating students continue their research training in a postdoctoral fellowship position. Well-prepared pharmacologists have a wealth of opportunity to use their newly obtained skills, including jobs in large pharmaceutical industry, smaller biotechnology, academic or government research. Often these positions allow for the search for and research into the discovery of novel therapeutic agents.

Students enter the program with the goal of obtaining a Ph.D. degree in pharmacology and begin by receiving training in the basic principles of drug action, molecular and cellular pharmacology and toxicology, physiology, biochemistry, statistics and scientific communications and ethics. In the first year, students also complete three research rotations in three different laboratories in a search for a dissertation research mentor. Additional specialty courses are offered in neuroscience/neuropharmacology, behavioral pharmacology, cardiovascular pharmacology, drug and alcohol abuse, immunopharmacology, pharmacokinetics and experimental therapeutics. All of the didactic course work leading to the Ph.D. degree will be completed in the

first two years of study. Following this formal training, the student will undertake a creative, independent research project under the supervision of a qualified faculty member. Examples of funded research areas in the department include antihypertensive therapies, antibody-based therapeutics of drug abuse, neuropharmacology and behavioral pharmacology, oxidative stress, aging and DNA damage. At the completion of the research phase, the project is written in the form of a dissertation and orally defended to faculty dissertation committee. As with any research degree, the measure of success depends upon excellence in research.

**Prerequisites to Degree Program.** Applicants should have an undergraduate grade-point average of 3.0 or higher and above average scores on the Graduate Record Examination. Prerequisite coursework should include satisfactory completion of undergraduate courses in mathematics, general chemistry, organic chemistry and biology. Other important, but not required, courses are biochemistry, physiology and anatomy, calculus, physics and statistics. On occasion, other advanced coursework may be substituted for certain required classes.

**Requirements for the Doctor of Philosophy Degree.** The Ph.D. degree will be awarded to candidates who successfully complete the required course work (minimum of 32 semester hours of coursework), and dissertation research hours (minimum of 18 credit hours of dissertation research). The current program requirements are posted on the Departmental and program website ([Pharmacology Graduate Program - Department of Pharmacology and Toxicology - University of Arkansas Medical Sciences](#)).

**Interdisciplinary Track in Neuroscience.** The Department of Pharmacology has a program of study leading to a Ph.D. in Pharmacology with emphasis in Neuroscience. Faculty expertise from various disciplines including Anatomy and Neurobiology, Microbiology and Immunology, Pharmacology, and Physiology and Biophysics provide students with comprehensive training in diverse areas of neurobiology. Degree requirements are the same as described in the traditional pathway leading to a Ph.D. in Pharmacology except that students would be required to take nine hours of course work from approved neuroscience electives.

**Track in Pharmaceutical Sciences.** The Department of Pharmacology and Toxicology has a program of study leading to the Ph.D. in Pharmacology with emphasis in Pharmaceutical Sciences. The Pharmaceutical Sciences Track provides an interdisciplinary educational opportunity for students to concentrate their studies in the pharmaceutical sciences. Degree requirements are the same as described in the traditional pathway leading to a Ph.D. degree in Pharmacology except for the addition of two required courses: Pharmaceutics for Graduate Students (PHSC 5033) and Medicinal Chemistry for Graduate Students (PHSC 5013).

## Pharmacology (PCOL)

**PCOL 5033 General Principles of Pharmacology and Toxicology (II)** This course offers an overview of the principles and general mechanisms underlying the effects of drugs and chemicals on biological systems. The application of these principles to proper experimental design is also considered.

**PCOL 5203/5213 Experimental Pharmacology and Toxicology I and II (II, I)** In these two courses, student will obtain a basic understanding of the latest techniques in experimental pharmacology and toxicology with an emphasis on animal models of human disease. Material will be presented in formal lectures and demonstrations. Prerequisites for PCOL 5203 are PCOL 5033 or consent of the course director. Prerequisites for PCOL 5213 are PCOL 5033 and PCOL 500V or consent of the course director.

**PCOL 500V Medical Pharmacology (I, II)** Lecture material systematically covers all major drugs of medical interest. Each drug is considered from the standpoint of fundamental modes of action on the various body systems, therapeutic uses, available preparations, and toxicity. Prerequisite: PHYO 5013 or equivalent.

**PCOL 501V Research in Pharmacology and Toxicology (1-9) (I, II)** Students will participate in research projects under the supervision of a faculty member. (Same as INTX 501V)

- PCOL 5201 Pharmacology and Toxicology Journal Club (I, II)** Students will read recent, high profile contributions to the Pharmacology/Toxicology literature, present a summary of the paper, critique the methodology and data interpretation, and encourage discussion among the class/attendees. All enrolled students must present a paper.
- INTX 5051 Pharmacology and Toxicology Seminar (I, II)** Students in both Pharmacology and Interdisciplinary Toxicology programs will participate in this course and prepare a presentation on one or more topics related to their original research.
- PCOL 5211 Scientific Communication and Ethics I (I)** This course will provide formal training in scientific communication and ethics to students in the first and second years of graduate school. Various faculty within and outside the department will lead discussion concerning how to write and publish scientific studies and ethical conduct related to science. Students will also prepare an oral presentation of recent peer reviewed research. Prerequisites: enrollment in the Pharmacology or Interdisciplinary Toxicology Graduate degree program or permission of course instructor.
- PCOL 5221 Scientific Communication and Ethics II (II)** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5211
- PCOL 5231 Scientific Communication and Ethics III (I)** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5221
- PCOL5241 Scientific Communication and Ethics IV (II)** This course will provide additional formal training in scientific communications and ethics. Prerequisite: PCOL 5231
- INTX 5113 Molecular Foundations of Toxicology (I)** This course will provide students with an understanding of these approaches, in particular, their strengths and limitations. Each lecture topic will be followed by a session that will be in the format of a journal club presentation by the students on the previous lecture topic. Prerequisites: BIOC 5103; PHYO 5013; and PCOL 5033.
- INTX 5123 Systems Toxicology (II)** This course is focused on understanding the molecular basis of organ injury caused by relevant chemical agents/drugs. Each topic will include one or two didactic lectures, followed by a final class period which will focus on evaluation of a peer-reviewed journal article dealing with the subject. Prerequisites: BIOC 5103; PHYO 5013; and PCOL 5033.
- INTX 6653 Clinical Toxicology (II)** In this course, students will obtain a basic understanding of the latest developments in clinical toxicology with the emphasis on drug-induced adverse effects and poisonings. Material will be presented in formal lectures and demonstrations. Prerequisite is INTX 5033 or consent of the course director.
- PCOL 5123 Behavioral Pharmacology and Toxicology** An advanced course that offers an in-depth study of the interactions between drugs or toxicants and behavior with an emphasis on schedule-controlled behavior. Published scientific literature forms the basis of the instructional material. Prerequisites: PCOL 5033, or 500V, or an undergraduate pharmacology course (with approval), or equivalent, or consent of the course director.
- PCOL 5133 Neuropharmacology (2-4) (On demand)** This course offers a background in neurotransmitter and receptor systems found in the central nervous system. Emphasis is placed on the molecular and cellular organization and their regional distribution along with their possible role in disease processes, and the therapeutic approaches to the study and treatment of diseases of the central nervous system. Prerequisite: PCOL 500V.

**PCOL 514V Alcohol and Drug Dependency** Provides an interdisciplinary overview of the substance-abuse field with an emphasis on research approaches. The major classes of abused drugs are reviewed from molecular to cellular effects to epidemiology. Students are introduced to research on substance abuse by presentations from various faculty. Prerequisites: PCOL 500V, 5033, an undergraduate pharmacology course, or equivalent.

**PCOL 700V Doctoral Dissertation (1-10) (I, II, S)** Prerequisite: candidacy and consent.

## APPENDIX

Samples of forms used by the Graduate School are listed in this Appendix. Please refer to the Graduate School website for up-to-date forms.

[http://www.uams.edu/gradschool/faculty/GS%20forms\\_copy.asp](http://www.uams.edu/gradschool/faculty/GS%20forms_copy.asp)

Add/Drop .....	A-1
Withdrawal.....	A-2
Student Clearance .....	A-3
Application for Travel Funds.....	A-4
Degree Application.....	A-5
Doctor of Philosophy Candidacy Examination.....	A-6
Doctoral Advisory Committee.....	A-7
Thesis Advisory Committee.....	A-8
Course Approval.....	A-9
Inter-College Cross-Listing Request.....	A-10
Request for Tuition Payment for Ph.D. Graduate Assistants.....	A-11
Graduate Faculty Application.....	A-12
Application for Outside Faculty Member for Dissertation Committee.....	A-13