GRADUATE SCHOOL

The following courses, listed alphabetically by department, have been approved for graduate credit. Please see the Interdepartmental (IDPT) section for courses which are taught cooperatively by individual departments.

### BIOCHEMISTRY AND MOLECULAR GENETICS

**BMGN 7650**  Research in Biochemistry and Molecular Genetics  
Variable cr.  
Dr. P. Megee – 303-724-3270.  Prereq: Consent of instructor.  
Research work in biochemistry and molecular genetics.

**BMGN 7660**  Biochemistry Seminar  
1.0 cr.  
Dr. P. Megee – 303-724-3270.  
Seminar series provides a forum for the presentation of scientific experiments and information in biochemistry by faculty, postdoctoral fellows, graduate students, and invitee outside guest speakers.

**BMGN 8990**  Doctoral Thesis  
Variable cr.  
Dr. P. Megee – 303-724-3270.  Prereq: Consent of instructor.  
Doctoral thesis work in biochemistry and molecular genetics.

### BIOINFORMATICS

**BIOI 7210**  Introduction to Computer Science  
3.0 cr.  
Dr. D. Lezotte – 303-315-6873.  Prereq: CU Boulder CSCI 3155 or equivalent.  
Overview of artificial intelligence methods, theories, and applications. Relationships between artificial intelligence and psychology, linguistics, and philosophy. Introduction to artificial intelligence programming.

**BIOI 7410**  Introduction to Bayesian Statistics  
3.0 cr.  
Prereq: MATH 3800 or MATH 4810 and MATH 4820 or equivalent.  
Introduction to Bayesian Statistical Methods. Covers prior and posterior distributions, conjugate models, single and multi parameter models, hierarchical models, mixture models, numerical methods for evaluating posterior distributions, Monte Carlo methods and Markov chain Monte Carlo simulations.

**BIOI 7412**  Mathematics for Bioscientists  
1.0 cr.  
Dr. S. Billups - 303-315-6873.  Crosslisted: CU Denver MATH 5198.  
Prereq: Consent of instructor.  
Develops mathematical reasoning; introduces linear algebra, discrete structures, graph theory, probability, and differential equations, using applications to molecular biology.

**BIOI 7601**  Selected Studies in Biomedical Science for Bioinformatics Students 1  
3.0 cr.  
Selected topics in structural, cellular and molecular biology chosen among the lectures offered in IDPT 7801.

**BIOI 7602**  Selected Studies in Biomedical Science for Bioinformatics Students 2  
3.0 cr.  
Selected topics in structural, cellular and molecular biology chosen among the lectures offered in IDPT 7802.

**BIOI 7603**  Selected Studies in Biomedical Science for Bioinformatics Students 3  
3.0 cr.  
Selected topics in structural, cellular and molecular biology chosen among the lectures offered in IDPT 7803.

**BIOI 7605**  Ethics and Values in Computational Bioscience Research  
1.0 cr.  
Dr. M. Yarborough - 303-315-6873.  Prereq: Consent of instructor.  
This course will examine the philosophical basis for current research ethics practices, address current ethical issues and controversies in bio-computational research, and provide students with knowledge and analytical skills to address the ethical dimensions of biomedical informatics.

**BIOI 7606**  Statistics for the Basic Sciences  
3.0 cr.  
This course provides an overview of fundamental concepts in statistics such as hypothesis testing and estimation and it provides an overview of statistical methods (for example, regression and analysis of variance) that apply to many areas of science.
This course is designed to give an introduction to statistical methods in genetic association studies. Topics include an introduction to population genetics and concepts relevant to genetic association studies including design strategies and analysis methods for case-control and family data.

What is bioinformatics and why study it? How is large-scale molecular biology data generated, where and how can researchers gain access to it, and what computational analyses are possible?

Inference problems and computational techniques for molecular biology, with emphasis on machine learning approaches. Use of computational induction techniques focused on information extraction from biomedical literature, inference of biochemical networks from high-throughput data, and prediction of protein function.

This course is for the advanced student who desires to pursue one or more bioinformatics-related topics in considerable depth. Supervision by a full-time faculty member is necessary.

A seminar course in which students read and present recent publications from the primary bioinformatics literature.

Special topics course with focus on new emerging bioinformatics and computational biology problems and techniques.

Doctoral thesis work in bioinformatics.

An introduction to statistical methods in the health sciences emphasizing the use of statistics to answer research questions. Content includes descriptive and statistical inference; statistical methods include t-tests, chi-square tests, one-way ANOVA, and linear regression. Statistical software is used.

This course provides an overview of fundamental concepts in statistics such as hypothesis testing and estimation, and it provides an overview of statistical methods (for example, regression and analysis of variance) that apply to many areas of science.

This is a first course in applied statistics that covers elementary probability, descriptive, parametric and nonparametric methods for one and two sample estimation and testing, and some common simple cases of the univariate general linear model. The statistical package SAS is used extensively.

This is a continuation of BIOS 6611 covering univariate linear modeling and emphasizing multiple regression and analysis of variance. Logistic regression and methods for correlated data are also covered. Matrix algebra and the statistical package SAS will be used.
BIOS 6613  Advanced Statistical Modeling  3.0 cr.
This course a variety of advanced statistical modeling methods used in the analysis of complex data. The
course includes extensive analysis of real data and uses the statistical package SAS and some matrix algebra and calculus.

BIOS 6621  Statistical Consulting  1.0 cr.
Students will gain experience with statistical consulting and common statistical problems and techniques
encountered in consulting through a combination of real examples and consultations with investigators. Under faculty
supervision, advanced students will work on consulting projects with investigators.

BIOS 6631  Statistical Theory 1  3.0 cr.
This course presents an introductory coverage of the theory of discrete and continuous random variables and
applications to statistical problems. Topics include probability theory, transformations and expectations, common families
of distributions, multiple random variables, and properties of a random sample.

BIOS 6632  Statistical Theory 2  3.0 cr.
This course covers theoretical and applied fundamentals of statistical inference. The course is a continuation of
BIOS 6631. The primary topics include point estimation, hypothesis testing, interval estimation and asymptotic methods.

BIOS 6646  Survival Analysis  2.0 cr.
This course covers the analysis of time-to-event data with applications to biology, medicine, and public health.
Nonparametric methods for group comparisons and semi-parametric regression models will be emphasized. Parametric
methods and distribution theory for survival analysis will also be included.

BIOS 6648  Design of Clinical Trials and Experiments  2.0 cr.
Dr. J. Kittelson – 303-315-9030.  Prereq: BIOS 6611 or BIOS 6601.
The design and conduct of human intervention trials. Specific topics include: specifying the research question, study
endpoints, study populations, study treatments, sample size evaluation, and choice of control groups. Common trial
designs and issues in trial monitoring are described.

BIOS 6649  Statistical Methods for Clinical Trials  1.0 cr.
Dr. J. Kittelson – 303-315-9030.  Coreq: BIOS 6612 and 6648.
This course is a companion to BIOS 6648 that focuses on statistical issues in the design and analysis of clinical trials
including sample size calculations, trials with repeated measurements, and the statistical aspects of trial monitoring (group
sequential designs).

BIOS 6651  Masters Research Paper  Variable cr.
Faculty – 303-315-9030.
Masters research paper in biostatistics.

BIOS 6655  Statistical Methods in Genetic Association Studies  2.0 cr.
Dr. T. Fingerlin – 303-315-9030.  Prereq: BIOS 6612.
This course is designed to give an introduction to statistical methods in genetic association studies. Topics
include an introduction to population genetics topics relevant to genetic association studies, design strategies, and
analysis methods for case-control and family data.

BIOS 6680  SAS Programming for Research Data Management  2.0 cr.
Dr. J. Bondy - 303-315-8021.
This course provides the necessary introduction and experience to prepare data for statistical analyses.
Specifically, this course will include: inputting, manipulating, recording, reformatting, and organizing information into
system/software/study specific formats. This course will also emphasize report writing and some simple statistical
analyses using popular statistical software used in medical research.

BIOS 6681  Relational Data Management Systems for Medical Research  1.0 cr.
Dr. D. Lezotte – 303-315-6873.
This course provides the necessary introduction and experience to build and maintain information systems to
facilitate data intensive clinical, epidemiological or health services research in an academic health sciences environment.
This course addresses: database design, building data dictionaries, system implementation, maintenance, report writing
and exporting data to other systems for analyses.

BIOS 6683  Introduction to Health Information Technology  3.0 cr.
Dr. P. Kaplan – 303-315-6873.  Prereq: Consent of instructor, graduate degree in clinical sciences or PRMD 6603.
An introductory course in Medical Informatics that exposes students to a broad spectrum of computer-based
applications in the areas of clinical medicine and public health; with focus on applications that use data, information and
knowledge processed by computers to improve the quality and efficiency of clinical medicine and delivery of public health
services.
BIOS 6840  Research in Biostatistics
Dr. G. Grunwald – 303-315-9030.
This course is for the Masters student who wishes to pursue one or more topics in depth. These topics may involve bio-statistical material, or biological material necessary to the student’s bio-statistical work. Supervision by a full-time faculty member is necessary.

BIOS 6950 Masters Thesis
Faculty – 303-315-9030.
Masters thesis work in biostatistics.

BIOS 7711  Longitudinal Data Analysis
The theory and application of univariate and multivariate techniques appropriate for longitudinal data are discussed with emphasis on recently developed growth curve and longitudinal models. Students will be exposed to theoretical developments and will analyze real data.

BIOS 7712 Special Topics in Statistics
This course will cover special topics in applied statistics. Details of content will be announced by the instructor.

BIOS 7713 Statistical Methods for Missing Data
This course covers methodological research being carried out for longitudinal studies with missing data. Topics include missing data mechanisms, non-ignorable missing data, multiple imputation, mixture models and sample size determination. Students will complete a project applying methods to real datasets.

BIOS 7899 Independent Study in Biostatistics
Dr. G. Grunwald - 303-315-9030. Prereq: Consent of instructor.
This course is for the advanced student who wishes to pursue one or more topics in depth. These topics may involve bio-statistical material, or biological material necessary to the student’s bio-statistical work. Supervision by a full-time faculty member is necessary.

BIOS 8990 Doctoral Dissertation
Faculty - 303-315-9030.
Doctoral thesis work in biostatistics.

BMST 7350  Protein Chemistry 1
This course will provide the chemical and physical basis for protein structure, folding, function and stability. Students will be expected to demonstrate an understanding of the mechanisms of protein folding and structure and an ability to devise strategies for stabilizing protein molecules.

BMST 7354 Structural Analysis of Bio-molecules 1
This course describes the fundamentals of spectroscopic methods used to study protein structure and function. These techniques include optical methods (CD spectroscopy, fluorescence and absorbance), vibrational methods (IR and ESR), analytical ultracentrifugation, mass spectrometry, calorimetry, light scattering and Biacore analysis.

BMST 7450  Protein Chemistry 2
This course presents methods and principles of protein/peptide purification and enzyme catalysis, including electron transfer and mutagenesis. In addition, the investigation of protein and enzyme structure/function, the role of molecular dynamics, and the use of molecular simulations in investigations of protein-ligand and proteinprotein interactions will be presented.

BMST 7454 Structural Analysis of Biomolecules 2
Methods and strategies for determination of the primary and 3-dimensional structures of biologically important molecules. Crystallography, nuclear magnetic resonance spectroscopy and mass spectrometry will be taught in structural determination of proteins, nucleic acids complex carbohydrates, and lipid molecules.

BMST 7650 Research in Biomolecular Structure
Dr. R. Hodges – 303-724-3268. Prereq: Consent of instructor.
Research in biomolecular structure.
**BMST 7660  Biomolecular Structure Seminar**  
Dr. R. Hodges – 303-724-3268.  
Seminar series provides a forum for the presentation of scientific experiments and information in structural biology by faculty, postdoctoral fellows and graduate students.

**BMST 8990  Doctoral Thesis**  
Dr. R. Hodges – 303-724-3268.  
Doctoral thesis work in biomolecular structure.

**CANCER BIOLOGY**

**CANB 7600  Cancer Biology**  
This course integrates the examination of cancer at molecular, cellular, tissue, and organismal levels. It is open to all graduate students with an interest in mechanisms and models of cancer and will impart broad appreciation for current issues and problems.

**CANB 7613  Research Seminars and Journal Club**  
Dr. R. Evans – 303-724-4306.  
Current research topics in experimental pathology, virology, and tumor biology. Graduate students and faculty presentations.

**CANB 7620  Histophysiology**  
Dr. D. Orlicky - 303-724-4308.  
Discussions of cell interactions, tissue physiology, and renewal based upon the histologic cell types and structures present. Where pertinent, pathologic alterations will be introduced to facilitate identification of the important normal functions/structures.

**CANB 7650  Research in Cancer Biology**  
Faculty – 303-724-4301.  Prereq: Consent of instructor.  
Research work in cancer biology.

**CANB 8990  Doctoral Thesis**  
Faculty 303-724-4301.  Prereq: Consent of instructor.  
Doctoral thesis work in cancer biology.

**CHILD HEALTH ASSOCIATE/PHYSICIAN ASSISTANT**

**FIRST YEAR**

**SUMMER SEMESTER**

**MPAS 5100  Appendicular Anatomy**  
Dr. N. Bookstein, Ed.D. – 303-315-7963 x3. Max:40  
In-depth study of gross human anatomic structure with emphasis directed to musculoskeletal and neuromuscular systems. Clinical correlates consider normal movement and pathological processes of the appendicular skeleton.

**MPAS 5101  Axial Anatomy**  
Dr. N. Bookstein, Ed.D. – 303-315-7963 x3. Max:40  
Study of gross human anatomic structure with emphasis directed to musculoskeletal and neuromuscular system. Clinical correlates consider normal movement and pathological processes of the axial skeleton. Clinical correlates of visceral systems included.

**MPAS 5110  Immunology**  
Dr. J.J. Cohen – 303-315-7963 x3. Max:40  
A comprehensive course of basic and some clinical immunology with the stress on the human immune system.

**MPAS 5201  Psychosocial Aspects of Health Care I**  
K. Tick, MSW – 303-315-7963 x3. Max:40  
Emphasis is placed on the social, emotional and psychological factors affecting pregnancy and parent/newborn relationships. Basic communication skills in organizing an interview and developing a working relationship with parents are stressed. The team approach to comprehensive health care is also discussed.
MPAS 5400  Physical Diagnosis  Summer Sem.  2.0 cr.
J. Nieman, PAC; S. Hoops, PAC – 303-315-7963 x3. Max:40
This course consists of lectures on physical diagnosis of pediatric, adult and geriatric patients, with an opportunity to practice exam skills during practicum sessions.

MPAS 5601  Problem-Based Ambulatory Medicine  Summer Sem.  1.0 cr.
S. Hoops, PAC, E. Davis-Hall, PhD, PAC – 303-315-7963 x3. Max:40
An introduction to ambulatory medicine in a problem based format. This includes a demonstration of a problem based case, a review of comprehensive medical history taking as well as methods of accessing information to assist in solving clinical problems.

FALL SEMESTER*

MPAS 5111  Integrated Sciences Basic to Medicine I  Fall Sem.  4.0 cr.
M. Hall, PhD – 303-315-7963 x3. Max:40
This two semester sequence will cover and integrate the principles of biochemistry, physiology and clinical biochemistry. Clinical presentations will be used throughout the course to underscore the relationship between the basic sciences and the clinical presentation of disease.

MPAS 5120  Medical Microbiology  Fall Sem.  2.0 cr.
Dr. M. Abzug – 303-315-7963 x3. Max:40
Course covers the fundamental properties of pathogenic bacteria, viruses and fungi and the diseases these organisms cause. The various properties of bacteria are correlated with pathogenesis of disease.

MPAS 5202  Psychosocial Aspects of Health Care II  Fall Sem.  2.0 cr.
K. Tick, LCSW – 303-315-7963 x3. Max:40
This course addresses common psychological concerns seen in the pediatric setting, with special attention to the needs of the handicapped child and his family, child abuse, death, alcoholism, etc. Communication skills which enhance information gathering are discussed. Community resources are investigated.

MPAS 5300  Assessment and Care of the Neonate  Fall Sem.  2.0 cr.
Dr. M. Kohn – 303-315-7963 x3. Max:40
Common neonatal and infant medical problems are presented in preparation for the Lifespan clinical experience, MPAS 5930.

MPAS 5412  Physical Diagnosis  Fall Sem.  2.0 cr.
J. Nieman, PAC – 303-315-7963 x3 Max:40
This course is a continuation of MPAS 5400.

MPAS 5602  Problem-Based Ambulatory Medicine II  Fall Sem.  4.0 cr.
S. Hoops, PAC, E. Davis-Hall, PhD, PAC – 303-315-7963 x3 Max:40
This course is a continuation of MPAS 5601. Comprehensive care in ambulatory medicine is covered in a problem-based format. This includes infancy to adulthood, health maintenance and acute illnesses, anticipatory guidance/patient education, diagnosis and treatment and developmental assessment.

MPAS 5901  Community Clinic  Fall Sem.  2.0 cr.
S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3 Pass/Fail Max:25
Clinical experience designed to give the student an introduction to ambulatory medicine and an understanding of pediatric and family practice medicine. A related small group seminar is designed to discuss this clinical experience.

SPRING SEMESTER*

MPAS 5112  Integrated Sciences Basic to Medicine II  Spring Sem.  4.0 cr.
Dr. M. Hall, – 303-315-7963 x3. Max:40
This course is a continuation of MPAS 5111.

MPAS 5131  General and Systemic Pathology  Spring Sem.  5.0 cr.
Dr. M. Rizeq, Dr. S. Nawaz – 303-315-7963 x3. Max:40
Normal cell and tissue structure is correlated with functional aspects. Homeostasis and mechanisms of disease processes are discussed. Mechanisms to be discussed include cell and tissue injury and repair, inflammation, immunopathology, neoplasia, and metabolic and genetic abnormalities.

MPAS 5203  Psychosocial Aspects of Health Care III  Spring Sem.  2.0 cr.
K. Tick, LCSW – 303-315-7963 x3. Max:40
Theories of personality development and basic diagnostic categories of psychopathology are presented. Emphasis is given to ways this knowledge can be applied in working with families in the pediatric clinical setting. Adolescent development is also discussed. Communication skills used in counseling parents and children are stressed.
## Parenting

**MPAS 5220  Parenting**  
Spring Sem.  
1.0 cr.  
This small group seminar addresses techniques and approaches to guiding and advising clients in their role as parents.

## Women's Health

**MPAS 5420  Women's Health**  
Spring Sem.  
2.0 cr.  
E. Davis-Hall, PhD, PAC – 303-315-7963 x3 Max:40  
The course is designed to provide students with basic information about obstetrics and gynecology.

## Problem Based Ambulatory Medicine III

**MPAS 5603  Problem Based Ambulatory Medicine III**  
Spring Sem.  
4.0 cr.  
S. Hoops, PAC, E. Davis-Hall, PhD, PAC – Max:40  
This course is a continuation of MPAS 5602. Comprehensive care in ambulatory medicine is covered in a problem-based format. This includes infancy to adulthood, health maintenance and acute illnesses, anticipatory guidance/patient education, diagnosis and treatment and developmental assessment.

## Lifespan Clinical Rotation

**MPAS 5940  Lifespan Clinical Rotation**  
Spring Sem.  
4.0 cr.  
Students are introduced to the management of infants in the newborn nursery and the care of the geriatric patient in long term care settings such as nursing and assisted living homes.

## Pharmacology

**MPAS 6101  Pharmacology**  
Fall Sem.  
2.0 cr.  
Dr. T. French – 303-315-7963 x3. Max:40  
Discussion of the clinical aspects of drug absorption, metabolism, excretion, and the dynamics of drug action.

## Psychosocial Problems in Primary Care I

**MPAS 6201  Psychosocial Problems in Primary Care I**  
Fall Sem.  
2.0 cr.  
K. Tick, LCSW – 303-315-7963 x3. Max:40  
Discussion of emotional, behavioral, psychosomatic and psychiatric problems commonly encountered by physician assistants in primary care settings. Evaluation, management and appropriate referral will be emphasized.

## Pediatric Clinical Medicine I

**MPAS 6301  Pediatric Clinical Medicine I**  
Fall Sem.  
2.5 cr.  
J. Bowser, PAC – 303-315-7963 x3. Max:40  
Discussion of pediatric medical and surgical conditions, including pathophysiology, diagnosis and treatment.

## Adult Clinical Medicine I

**MPAS 6401  Adult Clinical Medicine I**  
Fall Sem.  
2.5 cr.  
J. Bowser, PAC – 303-315-7963 x3. Max:40  
Discussion of adult medical and surgical conditions, including pathophysiology, diagnosis and treatment.

## Pediatric Dermatology

**MPAS 6610  Pediatric Dermatology**  
Fall Sem.  
1.0 cr.  
Dr. J. Burch – 303-315-7963 x3. Max:15  
Discussions on evaluating and managing dermatologic problems in pediatrics.

## Nutrition

**MPAS 6620  Nutrition**  
Fall Sem.  
1.0 cr.  
Dr. S. Johnson – 303-315-7963 x3. Max:40  
A discussion of the principles of nutrition for patients of all ages, including the requirements for normal growth, development, and health maintenance, as well as special dietary needs for problems commonly seen in primary care.

## Evidence-Based Medicine I

**MPAS 6701  Evidence-Based Medicine I**  
Fall Sem.  
2.0 cr.  
A. Glicken, MSW – 303-315-7963 x3. Max:25  
Students are introduced to the conscientious, explicit and judicious use of current best evidence in clinical decision-making.

## Pharmacology for Child Health Associates II

**MPAS 6102  Pharmacology for Child Health Associates II**  
Spring Sem.  
4.0 cr.  
Dr. T. French – 303-315-7963 x3. Max:40  
This course is a continuation of MPAS 6101.

## Psychosocial Problems in Primary Care II

**MPAS 6202  Psychosocial Problems in Primary Care II**  
Spring Sem.  
2.0 cr.  
K. Tick, LCSW – 303-315-7963 x3. Max:40  
This course is a continuation of MPAS 6201.

## Pediatric Clinical Medicine II

**MPAS 6302  Pediatric Clinical Medicine II**  
Spring Sem.  
2.5 cr.  
C. Robohm, PAC – 303-315-7963 x3. Max:40  
This course is a continuation of MPAS 6301.
MPAS 6402  Adult Clinical Medicine II  
C. Robohm, PAC 303-315-7963 X3. Max:40
This course is a continuation of MPAS 6401.

MPAS 6510 Orthopedics  
S. Sullivan, PAC – 303-315-7963 x3. Max:40
A discussion of the principles of assessment and management of orthopedic problems for physician assistants in primary care. Laboratory sessions will provide an opportunity to practice orthopedic examinations and management techniques.

MPAS 6512 Emergency Medicine  
Course Director Pending – 303-315-7963 x3 Max:40
Discussion of the principles of assessment and management of medical and surgical emergencies.

MPAS 6512 Evidence Based Medicine II  
Glicken, MSW – 303-315-7963 x3. Max:40
This course is a continuation of MPAS 6701.

MPAS 6800 PA Role Development  
C. Ruff, PAC – 303-315-7963 x3. Pass/Fail Max:40
Lectures and discussions on PA professional development, including professional behavior, ethical decision making, and risk management.

MPAS 6300 Pediatric Clinical Preceptorships (sections I, II)  
Students will learn clinical skills in pediatrics, including history taking, physical diagnosis, assessment and patient management under the supervision of community clinical preceptors. Students will also be required to discuss current clinical experiences in a group format.

MPAS 6310 Adolescent Clinical Preceptorship (rural track)  
Rural track students will learn clinical skills in adolescent medicine, including history taking, physical diagnosis, assessment and patient management under the supervision of community clinical preceptors. Students will also be required to discuss current clinical experiences in a group format.

MPAS 6400 Family Medicine Clinical Preceptorship  
Students will perfect clinical skills in family medicine, including history taking, physical diagnosis, assessment and patient management under the supervision of community clinical preceptors. Students will also be required to discuss current clinical experiences in a group format.

MPAS 6500 Surgery Clinical Preceptorship  
Students will learn clinical skills in surgical medicine, including history taking, physical diagnosis, assessment and patient management and will observe or participate in surgical procedures under the supervision of community clinical preceptors.

MPAS 6600 Elective Clinical Preceptorships (sections, I, II)  
Students will develop assessment and patient management skills in medical or surgical specialties under the supervision of community clinical preceptors. Students will also be required to discuss current clinical experiences in a group format.

CHAM 6704 Master’s Project Proposal  
A. Glicken, MSW – 303-315-7963 x3. Max:40
The first segment of the clinical research project involves formulating a worthy problem for investigation including an in-depth review of the literature, overview of the methodology, its feasibility and limitations, plans for analysis of data, and timetable of the study. An expert in the field and a program faculty sponsor should be solicited as advisors.
The second segment of the project includes carrying out all field work and data collection of the approved proposal, analysis of data, and preparation of the final report. Advisors/consultants should be utilized to monitor each step as it proceeds.

The third segment of the graduate project demands an oral presentation of the completed project to CHAP faculty, students, instructors, project sponsors, and other interested parties. Preparation of effective audiovisual aids and fielding questions after the presentation are integral parts of this presentation. The study should also be prepared for the publication in the appropriate journal if feasible.

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<th>Course Code</th>
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<th>Credits</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>CHAM 6710</td>
<td>Master’s Project Final Report</td>
<td>1.0 cr.</td>
<td>A. Glicken, MSW – 303-315-7963 x3. Max:40</td>
</tr>
<tr>
<td>CHAM 6711</td>
<td>Masters Project Oral Presentation</td>
<td>1.0 cr.</td>
<td>A. Glicken, MSW – 303-315-7963 x3. Max:40</td>
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THIRD YEAR

ALL SEMESTERS

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<tr>
<td></td>
<td>Ambulatory Pediatric Medicine (Sections I, II, III, IV and V)</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
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<td>Course Code</td>
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Attendance at deliveries is encouraged and participating in the night and weekend call schedule may be required.

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<th>Semesters</th>
<th>Instructor, Phone</th>
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This course for regular track students involves active participation in an emergency department or urgent care practice. Attendance at meetings, conferences, and participating in the night and weekend call schedule are required.

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<tbody>
<tr>
<td>CHAM 6950</td>
<td>Rural Track Ambulatory Pediatrics</td>
<td>All Sems.</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
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</table>

This course involves active participation in an ambulatory pediatrics practice in the same geographical region as the rural family medicine block, or in a location to which the rural family medicine practice (CHAM 6952 Sections 1, 2, 3) refers their patients.

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<tbody>
<tr>
<td>CHAM 6952</td>
<td>Rural Track Family Medicine (Sections I, II and III)</td>
<td>All Sems.</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
</tr>
</tbody>
</table>

The rural track family medicine block is comprised of three sections. All three sections must be completed in sequence in a single family medicine practice located in rural Colorado. The sequence involves active participation in the care of patients in a family medicine setting, including health maintenance, diagnosis and treatment, patient education and follow-up for patients of all ages.

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<tr>
<td>CHAM 6954</td>
<td>Rural Track Women’s Health</td>
<td>All Sems.</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
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</table>

This course for rural track students involves active participation in an obstetrics and gynecology practice. Attendance at deliveries is encouraged and participating in the night and weekend call schedule may be required.

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<tbody>
<tr>
<td>CHAM 6956</td>
<td>Rural Track Emergency Medicine/Urgent Care</td>
<td>All Sems.</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
</tr>
</tbody>
</table>

This course involves active participation in an emergency department or urgent care practice. Ideally in the same geographical region as the rural family medicine block, or in a location to which the rural family medicine practice (CHAM 6952 sections 1, 2, and 3) refers their patients. Attendance at deliveries is encouraged and participating in the night and weekend call schedule may be required.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Semesters</th>
<th>Instructor, Phone</th>
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This clinical experience involves active participation in a specialty area of adult medicine.

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<tr>
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<th>Semesters</th>
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This clinical experience involves active participation in a specialty area of adult surgery.

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<tr>
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<th>Credits</th>
<th>Semesters</th>
<th>Instructor, Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAM 6974</td>
<td>Adult Internal Medicine (regular Track)</td>
<td>All Sems.</td>
<td>2.0 cr.</td>
<td>S. Hoops, PAC, J. Nieman, PAC – 303-315-7963 x3. Pass/Fail Max:25</td>
</tr>
</tbody>
</table>

This course for regular track students involves active participation in an internal medicine adult practice in either the outpatient or inpatient setting. Participating in the night and weekend call schedule may be required.

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<th>Credits</th>
<th>Semesters</th>
<th>Instructor, Phone</th>
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Requirements and credit to be arranged.

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<th>Course Code</th>
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<th>Credits</th>
<th>Semesters</th>
<th>Instructor, Phone</th>
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This course is designed for CHAPA students returning to third year, following a leave of absence. Requirements and credit to be arranged.

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**CLINICAL SCIENCE**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Semesters</th>
<th>Instructor, Phone</th>
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</thead>
<tbody>
<tr>
<td>CLSC 6040</td>
<td>Intro to Database &amp; Web Design Programming</td>
<td>1.0 cr.</td>
<td>All Sems.</td>
<td>J. Huggins, MSW, MSCIS - 303-399-8020 x3096</td>
</tr>
</tbody>
</table>

Prereq: Graduate degree in clinical science or PRMD 6603 or consent of instructor.
This course will provide the student with hands-on training for designing and creating both a database and a website page for research project team use. For students without prior programming experience, this introductory class is a general pre-requisite to all other health information technology classes.
CLSC 6050  Designing and Implementing Clinical Disease Management Programs  2.0 cr.
Dr. D. Tinkelman - 303-399-8020 x 3716. Prereq: BIOS 6601 or BIOS 6601 or BIOS 6612 are suggested.
This course is designed to introduce participants to the new and broadening field of disease management. Students will learn about the positive and negative aspects of varied approaches in the field. The economic and clinical aspects of disease management will be discussed.

CLSC 6060  Systems Analysis and Design  3.0 cr.
Dr. J. Karimi - 303-399-8020 x 3716. Crosslisted: CU Denver ISMG 6040. Prereq: Computer programming experience CLSC 6040 is preferred.
Offered as a collaborative offering with UCD and HSC faculty, this course emphasizes information requirements analysis, logical system specification, and detailed system design. Topics include structured system development methodologies, prototyping, file design, systems architecture, systems testing and software design strategies.

CLSC 6080  Database Management Systems  3.0 cr.
Dr. W. Zhiping - 303-399-8020 x 3716. Prereq: Computer programming experience CLSC 6040 is preferred.
Offered as a collaborative offering with UCD, this course focuses on the development and management of database systems to support business operations. Important subjects include semantic data modeling, normalization, SQL, fourth generation languages, and client-server database applications.

CLSC 6120  Data Communications  3.0 cr.
Dr. B. Ghosh - 399-8020 x 3716. Crosslisted: CU Denver ISMG 6120 Prereq: Computer programming experience CLSC 6040 is preferred.
Offered as a collaborative offering with UCD, this course introduces the basic concepts of data transmission, principles governing the design and administration of both wide and local area networks, and technical issues pertaining to client server computing and open system interconnection.

CLSC 6250  Introduction to Medical Informatics  3.0 cr.
Dr. D. Lezotte - 303-315-6873. Prereq: Graduate degree in clinical science or PRMD 6603 or consent of instructor.
Introductory course in medical informatics, exposing students to the entire spectrum of medical informatics applications and teaching skills to design and manage information systems that use data to promote improved quality and efficiency of clinical care.

CLSC 6251  Assistive Technology: Advanced Practices in AT Assessment  3.0 cr.
Dr. C. Bodine, M. Melonis, M.N.S. - 303-315-1281. Prereq: Consent of instructor.
Students will learn to use family-centered, trans-disciplinary methods of assistive technology assessment for individuals with low-incidence disabilities. Observations, videotaped learning activities, and supervised assessment sessions will facilitate understanding of best practice in this field.

CLSC 6261  Assistive Technology: Implement for Low Incidence Disabilities  3.0 cr.
Dr. C. Bodine, M. Melonis, M.N.S. - 303-315-1281. Prereq: Consent of instructor.
This course provides an overview of low incidence populations (including intellectual, hearing, and vision impairments), relevant research, and implementation strategies in early childhood and classroom settings. Emphasis is on implementation techniques, and working with trans-disciplinary teams, supporting agencies, and families.

CLSC 6271  Assistive Technology: Advanced Fieldwork Experience in AT  2.0 cr.
Dr. C. Bodine, M. Buning, M. Melonis, M.N.S. - 303-315-1281. Prereq: Consent of instructor.
Students will participate in fieldwork that offers tailored opportunities to engage in AT assessments and implementation in various settings. A peer-reviewed submission must be coordinated before a grade is assigned for this course.

CLSC 6281  Assistive Technology: Engineering and Biotechnology: Principles & Emerging Technologies  3.0 cr.
Dr. C. Bodine, Dr. M. Lightner - 303-315-1281. Prereq: Consent of instructor.
The student will develop an understanding of engineering principles and the technical design process relevant to assistive technology. The course will provide hands-on experience in several technologies to give the students a real-life appreciation of specific technologies and processes.

CLSC 6300  Scientific Grant Review Process: GCRC Proposals  1.0 cr.
Dr. R. Eckel, Dr. R. Sokol - 303-399-8020 x 3716. Prereq: BIOS 6601 or BIOS 6612 and CLSC 7500.
Intended for second-year masters students. Students will understand and participate in the process of scientific review of human subject research protocols submitted to the University of Colorado at Denver and Health Sciences Center’s GCRCs (both Adult and Pediatric GCRCs).

CLSC 6500  Introduction to Pediatric Research  1.0 cr.
Dr. L. Shroyer, Dr. C. Battaglia, - 303-399-8020 x 3716. Prereq: Graduate degree in clinical science or consent of instructor.
An introduction is provided for the general field of clinical science with a focus on topics relevant to the field of pediatrics. Designed for individuals who are interested in learning the fundamentals of how to prepare a scientific research proposal.
CLSC 6501  Introduction to Adult Medicine Research  
Dr. L. Shroyer, Dr. C. Battaglia - 303-399-8020 x3716. 
Prereq: Graduate degree in clinical science or consent of instructor. 
An introduction is provided for the general field of clinical science with a focus on topics relevant to the field of adult medicine. Designed for individuals who are interested in learning the fundamentals of how to prepare a scientific research proposal.

CLSC 6502  Clinical Research Training Program Intensive, Part 1  
Dr. L. Shroyer - 303-399-8020 x3716 . 
Prereq: Graduate degree in clinical science or PRMD 6603 or consent of instructor. 
CRTP Intensive.

CLSC 6503  Clinical Research Training Program Intensive, Part 2  
Dr. L. Shroyer - 303-399-8020 x 3716. 
Prereq: CLSC 6502, CRTP Intensive - Part 2.

CLSC 6550  Applications of Biostatistics Clinical Research Questions  
Dr. M. O'Brien - 303-399- 8020 x 3716. 
Prereq: Graduate degree in clinical science or consent of instructor. 
An introduction to allow clinician-scientists to be critical consumers of the medical literature by improving their ability to discuss statistical issues about their own research and the research of others. A familiarity will be gained with commonly used statistical methods and terms.

CLSC 6650  Guided Research Tutorial – General  
Dr. L. Shroyer - 303-399-8020 x3716. 
Prereq: Consent of instructor. 
Certificate or masters students perform research projects during rotations under the direction of a mentor. Required for clinical sciences program students (M.S.C.S).

CLSC 6651  Guided Research Tutorial Pediatric GCRC Research  
Dr. F. Accurso - 303-399-8020 x3716. 
Prereq: CLSC 6300, CLSC 7300 and CLSC 7500. 
Students perform Pediatric GCRC research projects during rotations under the direction of Pediatric GCRC faculty member(s).

CLSC 6652  Guided Research Tutorial – Adult GCRC Research  
Dr. M. Garrity - 303-399-8020 x3716. 
Prereq: CLSC 6300, CLSC 7300 and CLSC 7500. 
Students perform Adult GCRC research projects during rotations under the direction of an Adult GCRC faculty member(s).

CLSC 6653  Key Concepts in Neuro-developmental Disabilities 1  
Dr. J. Browne - 303-864-5267. 
Prereq: Graduate degree in clinical science or consent of instructor. 
This course represents part 1 of a two-part interdisciplinary course series focused on systems, options for diagnosis and assessment, as well as alternatives for service provision related to children, youth, and young adults with neuro-developmental and related disabilities.

CLSC 6654  Key Concepts in Neuro-developmental Disabilities 2  
Dr. Browne - 303-864-5267. 
Prereq: Graduate degree in clinical science or consent of instructor and CLSC 6653. 
This course represents part 2 of a two-part interdisciplinary course series focused on service provision and intervention strategies related to children, youth, and young adults with neuro-developmental and related disabilities.

CLSC 6655  Guided Research Tutorial – Proteomics  
Dr. L. Shroyer, Dr. F. Accurso -303-399-8020 x 3716. 
Prereq: Graduate degree in clinical science or consent of instructor. 
Students perform research projects during rotations under the direction of a mentor in the U01 Proteomics Clinical Research Network. Required of graduate students in the clinical sciences program participating in the U01.

CLSC 6657  Cultural Factors in Healthcare  
Dr. S. Manson, C. Mestas, M.A. - 303-864-5267. 
Prereq: Graduate degree in clinical science field or consent of instructor. 
This online course will introduce the subject of cultural and social determinants of maternal and child health in the present society, including worldviews on health perspectives (wellness versus illness), and address the impact of emerging demographic changes on systems of care.

CLSC 6658  An Interdisciplinary Approach to Promoting Early Parent Child Relationships Part I/ Theory  
Dr. C. Robinson, Dr. B. Deloian, Dr. K. Fehringer - 303-864-5267. 
Prereq: Graduate degree in clinical science or consent of instructor. 
This is Part 1 of a two-part course series which examines the theory and research relevant to the assessment of early parent-child relationships as well as the clinical application for interventions across disciplines intended to promote and improve child health outcomes.
CLSC 6659  An Interdisciplinary Approach to Promoting Early Parent Child Relationships Part 2/ Measurement 3.0 cr.
Dr. C. Robinson, Dr. B. Deloian, Dr. K. Fehringer - 303- 864-5267. Prereq: Graduate degree in clinical science or consent of instructor.

This is Part 2 of a two-part course which examines the research relevant to the assessment of early parent-child relationships, identifies intervention strategies by analyzing observational findings, and evaluates the effectiveness of interventions across disciplines that promote and improve child health outcomes.

CLSC 6661  Leadership Dialogues 1 1.0 cr.
Dr. C. Robinson, L. Edelman, M.S. - 303-864-5267. Prereq: A graduate degree in a clinical science field or consent of instructor.

This interdisciplinary leadership course focuses on leadership strategies needed for providing family-centered, culturally competent, community-based services for children with special needs and their families.

CLSC 6662  Leadership Dialogues 2 1.0 cr.
Dr. C. Robinson, L. Edelman, M.S. - 303-864-5267. Prereq: Graduate degree in a clinical science field or consent of instructor and CLSC 6661.

This interdisciplinary leadership course focuses becoming change agents to better provide family-centered culturally competent, community-based services for children with special needs and their families.

CLSC 6666  Trans-disciplinary Model Early Intervention Svc. Delivery 3.0 cr.
Dr. C. Robinson, R. Charlifue-Smith, M.A. - 303-864-5267. Prereq: Graduate degree in clinical science or consent of instructor.

This course provides instruction about the ENRICH model of community-based, family-driven, trans-disciplinary service delivery. The course will target service coordination and collaboration throughout Part C supports and services. Practicum is CLSC 6830.

CLSC 6699  Research in Clinical Sciences - Master Students Variable cr.
Dr. L. Shroyer - 303-399-8020 x3716. Prereq: Consent of instructor.

This research class is in the clinical science field that is planned to have direct relevance to a masters thesis project. Class work may also be associated with preparing for the written component of the master's final exam.

CLSC 6700  Evidence Based Medicine/Health Care 2.0 cr.
Dr. B. Brimhall, Dr. L. Shroyer, L. Traditi, M.L.S. - 303-399-8020 x 3716. Prereq: Graduate degree in clinical science or consent of instructor.

This course is introductory to evidence-based medicine and health care. Students will learn how to critically appraise the literature, evaluate diagnostic test performance, evaluate alternative therapies, use/design clinical pathways, and implement evidence based medicine findings in their own clinical practice settings.

CLSC 6800  Introduction to Health Information Technology 3.0 cr.
Dr. D. Lezotte - 303-315-6873. Crosslisted: CU Denver HLTH 6071 & BIOS 6683. Prereq: Graduate degree in clinical science or consent of instructor.

This course is intended as an overview to the dynamic environment of healthcare informatics and to prepare healthcare professionals to better utilize and manage emerging communication technologies. A brief introduction to e-health, telehealth, electronic medical records, telecommunications, and bio-informatics is provided.

CLSC 6820  Fundamentals of Health Information Technology Management 3.0 cr.
Dr. D. Lezotte, D. Jacobs - 303-399-8020 x 3716. Crosslisted: CU Denver HLTH 6072. Prereq: Graduate degree in clinical science field or consent of instructor.

This course will provide an introduction to the management of information technology in healthcare. A description of information processing, the origin, content and evolution of healthcare information systems and the methodologies deployed to acquire and manage information requirements will be discussed.

CLSC 6830  Practicum in Developmental Disabilities 3.0 cr.
Dr. C. Robinson - 303- 864-5267. Prereq: Graduate degree in clinical science or consent of instructor.

Practicum in developmental disabilities individually designed to give graduate students and post-graduates observational experiences in clinical, teaching, or research service settings and systems for persons with developmental disabilities of all ages.

CLSC 6831  Practicum in Developmental Disabilities 2 3.0 cr.
Dr. C. Robinson - 303-864-5267. Prereq: Instructor consent and/or CLSC 6830.

Practicum in developmental disabilities individually designed to give students and post graduates hands-on experiences in clinical, teaching, or research service settings and systems for persons with developmental disabilities of all ages.

CLSC 6890  Introduction to Telehealth/Telemedicine 2.0 cr
Dr. J. Grigsby - 303-399-8020 x 3716. Prereq: Graduate degree in clinical science or consent of instructor.

This course will examine different Telemedicine/Telehealth options currently available. A primary goal will be for students to evaluate how clinical outcomes and health care education (e.g., patient education and health care provider education) can be improved using new technologies.
CLSC 6950  Masters Thesis
Faculty - 303-399-8020 x 3716.  Prereq: Consent of instructor.
Masters thesis work in clinical science.

CLSC 7050  Designing and Implementing Clinical Disease Mgt. Programs  2.0 cr.
Dr. D. Tinkelman - 303-399-8020 x 3716. Prereq: BIOS 6601 or BIOS 6612 are suggested.
This course is designed to introduce participants to the new and broadening field of disease management.
Students will learn about the positive and negative aspects of varied approaches in the field. The economic and clinical aspects of disease management will be discussed.

CLSC 7101  Grant Writing 1  1.0 cr.
Dr. J. Crapo, Dr. L. Shroyer - 303-399-8020 x 3716. Prereq: BIOS 6601, CLSC 7150, BIOS 7151, PRMD 6626, BIOS 6648.
This first grant writing course will prepare students for subsequent grant submission. Strategies for preparation (including hypothesis generation, experimental design, statistical considerations, and potential problems) will be discussed. A grant submission will normally occur before a grade is assigned.

CLSC 7102  Grant Writing 2  1.0 cr.
Dr. J. Crapo, Dr. L. Shroyer - 303-399-8020 x 3716. Prereq: CLSC 7101.
This course prepares students for subsequent grant submission. Strategies for preparation (including hypothesis generation, experimental design, statistical considerations, and potential problems) will be discussed. At the end of the course, a KO8, R23, or equivalent national grant application will be completed for submission. A grant submission will normally occur before a grade is assigned.

CLSC 7150  Ethics and Regulation in Human Subjects Review  1.0 cr.
Dr. A. Prochazka, Dr. H. Milgrom, Dr. L. Shroyer - 303-399-8020 x 3716. Prereq: Graduate degree in clinical science or consent of instructor.
This course will provide an overview of the field of ethics in clinical research and is designed for students who will be conducting research involving human subjects. Attendance at IRB sessions for CLSC Ph.D. and certificate students enrolled is required.

CLSC 7151  Lectures in Ethics and Regulation in Human Subjects Review  1.0 cr.
Dr. A. Prochazka, Dr. H. Milgrom, Dr. L. Shroyer - 303-399-8020 x 3716. Crosslisted: PHSC 7339. Prereq: Graduate degree in clinical science or consent of instructor.
This course provides an overview of the field of ethics in clinical research and is designed for non-clinical science degree and certificate students and investigators who will be conducting research involving human subjects. Topics include historical background, current regulations, and IRB requirements.

CLSC 7155  Advanced Bioethics  1.0 cr.
Dr. A. Prochazka, Dr. L. Shroyer, Dr. M. Yarborough - 303-399-8020 x 3716. Prereq: CLSC 7150 or CLSC 7151, COMIRB 101, PHSC 7339 or instructor consent.
This course will provide an in-depth understanding of advanced bioethics- where the frontiers for ethical clinical decision-making currently exist – and also provide a broad-based overview of all aspects of responsible conduct of research according to NIH standards.

CLSC 7160  Philosophical Foundations of Research Ethics  2.0 cr.
Dr. M. Yarborough - 303-399-8020 x 3716. Prereq: CLSC 7150 or CLSC 7151 or CLSC 7155.
This course will examine the philosophical basis for current research ethics practices, addresses current ethical issues and controversies in biomedical research, and provides students with knowledge and analytical skills to address the ethical dimensions of biomedical research.

CLSC 7200  Clinical Outcomes Assessment  2.0 cr.
Dr. L. Shroyer, Dr. C. Battaglia - 303-399-8020 x 3716. Prereq: A graduate degree in a clinical science field or Consent of instructor.
This course provides an overview of the field of clinical outcomes assessment and prepares students to identify patient risk factors and to select outcomes appropriate to use in a given situation based on appraisal of literature regarding the research project’s objectives.

CLSC 7300  Scientific Grant Review Process: GCRC Proposals  1.0 cr.
Dr. R. Eckel, Dr. R. Sokol - 303-399-8020 x 3 716. Prereq: BIOS 6601, BIOS 6612 and CLSC 7500.
Intended for second-year Ph.D. students. Students will understand and participate in the process of scientific review of human subject research protocols submitted to the UCDHSC GCRCs (both Adult and Pediatric GCRCs).

CLSC 7400  Theory and Application of Techniques for the Study of Human Metabolism in Vivo  2.0 cr.
Dr. T. Horton, Dr. P. MacLean - 303-399-8020 x 3716. Prereq: CLSC 7150, BIOS 7151, CLSC 6500, CLSC 6501, PRMD 6626, BIOS 6648.
This advanced clinical investigation course will critically review lab-based techniques and experimental approaches used to study nutrient metabolism in vivo. Students will learn the theory, appropriate application and limitations of these technique/approaches.
**CLSC 7450**  Biopharmaceutics and Applied Pharmacokinetics  
Dr. T. Henthorn - 303-399-8020 x 3716. Prereq: BIOS 6601, BIOS 6612 and CLSC 7500.  
This advanced pharmacokinetics course will provide working knowledge of drug administration, distribution, metabolism and excretion as well as provide practical clinical working examples of pharmacokinetics (drug clearance and distribution).

**CLSC 7500**  Practical Application of Molecular and Cell Biology Techniques for the Clinical Investigator  
Dr. A. Bradford, Dr. J. Tentler - 303-399-8020 x 3716. Prereq: Graduate degree in clinical science or consent of instructor.  
Designed to teach clinical investigators "hands-on" approaches to basic molecular and cellular biology techniques. Weekly special topics lectures will cover cutting edge technologies and their clinical application of techniques.

**CLSC 7650**  Guided Research Tutorial – General  
Dr. L. Shroyer - 303-399-8020 x 3716. Prereq: Consent of instructor.  
Students perform research projects during rotations under the direction of a mentor. Research work in clinical science.

**CLSC 7651**  Guided Research Tutorial, Pediatric GCRC  
Dr. F. Accurso - 303-399-8020 x 3716. Prereq: CLSC 7500 and CLSC 7300.  
Students perform Pediatric GCRC research projects during rotations under the direction of Pediatric GCRC faculty member(s).

**CLSC 7652**  Guided Research Tutorial – Adult GCRC  
Dr. M. Garrity - 303-399-8020 x 3716. Prereq: CLSC 7500 and CLSC 7300.  
Students perform Adult GCRC research projects during rotations under the direction of an Adult GCRC faculty member(s).

**CLSC 7700**  Evidence Based Medicine/Health Care  
Dr. B. Brinhall, Dr. L. Shroyer, L. Traditl, M.L.S. - 303-399-8020 x 3716.  
This course is introductory to evidence-based medicine and health care. Students will learn how to critically appraise the literature, evaluate diagnostic test performance, evaluate alternative therapies, use/design clinical pathways, and implement evidenced based medicine findings in their own clinical practice settings. Doctoral students will also write a manuscript to be submitted related to a critical appraisal of the literature on a topic of their choice.

**CLSC 7890**  Research in Clinical Sciences - Ph.D. Students  
Dr. L. Shroyer - 303-399-8020 x 3716.  
Research in the clinical science field which has direct relevance to Ph.D. dissertation project (where student works under mentor faculty member’s guidance). Class work can be associated as preparation for the written component of the Ph.D. comprehensive exam and/or for the oral comprehensive exam.

**CLSC 8990**  Doctoral Thesis  
Faculty - 303-398-8020 x 3716. Prereq: Consent of the instructor.  
Doctoral thesis work in clinical science.

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**GENETIC COUNSELING**

*Students who take these courses must have matriculated into the MS Genetic Counseling Program.*

**GENC 6101**  Psychosocial Aspects of Genetic Counseling 1  
This is the first course in a two-semester sequence addressing basic psychosocial and counseling theories, approaches, and resources necessary for the provision of genetic counseling to clients and their families in prenatal, pediatric and adult clinical settings. The first semester focuses on human and family development, pregnancy and perinatal loss, and grief theory.

**GENC 6102**  Psychosocial Aspects of Genetic Counseling 2  
This is the second course in a two-semester sequence addressing basic psychosocial and counseling theories, approaches, and resources necessary for the provision of genetic counseling to clients and their families in prenatal, pediatric and adult clinical settings. The second semester focuses on family systems, crisis theory and intervention, grief and coping responses, and students’ integration of psychosocial approaches into their genetic counseling practice.

**GENC 6105**  Basic Interviewing Skills  
This course covers the fundamental theories and principles of effective patient/client interviewing in genetic counseling practice. Lectures are combined with hands-on role plays and interviews so that students may gain applied experience and receive feedback to foster skills development throughout the course.
GENC 6110  Topics in Medical Genetics 1  
First course in a two-course sequence regarding principles of clinical genetics and genetic counseling, and development of clinical skills used in various medical genetics settings. Fall semester focuses on principles important in pediatric and general genetics settings.

GENC 6111  Topics in Medical Genetics 2  
Second course in two-course sequence regarding principles of clinical genetics and genetic counseling used in various medical genetics settings, and development of clinical skills. Spring semester focuses on prenatal and adult genetics clinic settings.

GENC 6120  Clinical Cytogenetics and Molecular Genetics  
Dr. L. McGavran, Dr. E. Spector - 303-861-6839.  
Prereq: Consent of instructor.  
This course provides integrated instruction regarding human cytogenetic and molecular genetic principles, techniques, and diagnostic testing approaches used in clinical evaluation and risk.

GENC 6121  Laboratory in Clinical Cytogenetics and Molecular Genetics  
Dr. L. McGavran, Dr. E. Spector - 303-861-6839.  
Prereq: GENC 6120 or consent of instructor.  
This course provides an introduction to specific methodologies and interpretation of studies used in diagnostic cytogenetics and molecular genetics laboratories. Principles discussed in the co-requisite clinical cytogenetics and molecular genetics course will be applied through demonstrations, hands-on experiments, and discussion of illustrative cases.

GENC 6122  Seminar in Clinical Cytogenetics and Molecular Genetics  
Dr. L. McGavran, Dr. E. Spector - 303-861-6839.  
Prereq: GENC 6120 or consent of instructor.  
This course requires students to apply theories and principles of cytogenetics and molecular genetics to analysis of cases that present in the daily operations of diagnostic laboratories and formal critique of current research literature. Additionally, students present a formal seminar integrating cytogenetic and molecular genetic principles.

GENC 6130  Cancer Genetics and Genetic Counseling  
C. Walton, M.S. - 303-861-6839.  
Prereq: GENC 6110, GENC 6120.  
A course in the provision of genetic counseling services to clients with or at risk for hereditary cancer predisposition. Topics include clinical oncology, epidemiology, molecular biology of cancer, risk assessment, genetic testing, ethical/legal issues, clinical research considerations, psychosocial impact and support, and specific genetic counseling approaches.

GENC 6140  Human Inborn Errors of Metabolism  
Dr. J. VanHove, Dr. J. Thomas, Dr. C. Freehauf - 303-861-6395.  
Prereq: Consent of instructor.  
This course provides a systematic review of major metabolic disorders, including their clinical phenotypes, diagnosis, and management. Physiological and laboratory testing principles important to the understanding of these disorders will be reviewed. Psychosocial impact of metabolic disorders and genetic counseling approaches will be discussed.

GENC 6140  Risk Calculation in Genetic Counseling  
C. Walton, M.S. - 303-861-6839.  
Prereq: GENC 6110 and GENC 6120.  
This course covers pedigree analysis and risk calculation principles used by genetic counselors in clinical practice.

GENC 6910  Applied General Genetics Clinic  
C. Walton, M.S. - 303-861-6839.  
Prereq: GENC 6101, GENC 6105, GENC 6110.  
This is a clinical rotation for genetic counseling M.S. students through a general genetics clinic serving a variety of referral indications. Students will learn and practice case management, history taking, risk assessment, counseling, and client advocacy skills.

GENC 6911  Applied Prenatal Genetics Clinic  
C. Walton, M.S. - 303-861-6839.  
Prereq: GENC 6101, GENC 6105, GENC 6110.  
This is a clinical rotation for genetic counseling students through a prenatal diagnosis and genetics clinic. Students will learn and practice history taking, risk assessment, patient education and genetic counseling, and case management, as well as observe prenatal diagnosis and ART procedures.

GENC 6912  Applied Metabolic Genetics Clinic  
C. Walton, M.S. - 303-861-6839.  
Prereq: GENC 6101, GENC 6105, GENC 6110.  
This is a clinical rotation for genetic counseling students through a genetics clinic for inborn errors of metabolism. Students will work with patients referred for diagnostic evaluation, medical and nutritional management of specific conditions, and follow-up of positive newborn metabolic screening results.
GENC 6913  Applied Regional & Specialties Genetics Clinics  Variable cr.
This is a clinical rotation for genetic counseling students through regional outreach genetics clinics and
specialty/multidisciplinary clinics serving patients with various genetic conditions.

GENC 6914  Applied Hereditary Cancer Clinic  1.0 cr.
This is a clinical rotation for genetic counseling students through a hereditary cancer clinic for individuals
seeking genetic counseling and testing for genetic cancer predisposition syndromes.

GENC 6915  Applied Adult Medical Genetics Clinic  1.0 cr.
This is a clinical rotation for genetic counseling students through a medical genetics clinic and clinical research
settings providing diagnosis, management, risk assessment and genetic counseling for adults.

GENC 6919  Applied Medical Genetics Clinic  Variable cr.
This is an elective clinical rotation for genetic counseling students desiring to arrange training in settings outside
of core required clinical rotations or an additional, advanced rotation.

GENC 6950  Masters Thesis  Variable cr.
Faculty - 303-861-6839.  Prereq: Consent of instructor.
Masters thesis work in genetic counseling.

*Students who take these courses must have completed first year of the MS Genetic Counseling program

GENC 6201  Advanced Psychosocial Genetic Counseling  2.0 cr.
This course examines advanced genetic counseling techniques as they relate to psychosocial theories, specific
client characteristics, and the client/counselor dynamic. Critical discussion of core topics and readings, and case analysis
will be used for instruction.

GENC 6210  Professional Issues in Genetic Counseling 1  2.0 cr.
First course in a two- course sequence regarding professional practice issues of master's level genetic
counselors. The first semester course focuses on professional standards, professional ethics, legal principles, and health
systems and policy issues relevant to genetic counselors.

GENC 6211  Professional Issues in Genetic Counseling 2  2.0 cr.
Second course in a two course sequence regarding professional practice issues of master's level genetic
counselors. The second semester course focuses on disability issues, cultural competency, public health genetics,
research methods in genetic counseling and professional roles.

HMGP 7600  Survey of Human Genetics  2.0 cr.
Dr. R. Spritz  - 303-724-3101.
Survey of human genetics, including Mendelian and other forms of inheritance, chromosomes and cytogenetics,
molecular and biochemical basis of genetic disease, quantitative genetics and gene mapping, developmental and cancer
 genetics, clinical genetics, and genetic screening and prenatal diagnosis.

HMGP 7610  Topics in Human Genetics  1.0 cr.
Dr. R. Spritz - 303-724-3101.  Prereq: Graduate standing.
Two-semester course based on weekly HMGP seminar series. Students meet with each speaker and discuss
seminar or related topics and arranged readings.

HMGP 7620  Genomics  2.0 cr.
Dr. J. Sikela - 303-724-3101.
The goal of this course is to provide a thorough coverage of the field of genomics, including genome
sequencing and mapping, bioinformatics, DNA chips, comparative genomics, human DNA variation, medical genomics,
pharmacogenomics, and ethical issues arising from genome-based knowledge.

HMGP 7630  Independent Study in Human Medical Genetics  Variable cr.
Faculty - 303-724-3101.
Independent study is intended to permit students to carry out directed reading and discussion with a specific
faculty member to fill a specific need and to gain a defined expertise with a faculty member other than their thesis advisor.
Consent of the faculty member offering the independent study and the program director are required.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>HMGP 7650</td>
<td>Research in Human Medical Genetics</td>
<td>Variable cr.</td>
<td>Consent of instructor. Research work in human medical genetics.</td>
</tr>
<tr>
<td>IMMU 7602</td>
<td>Special Topics in Tumor Immunology</td>
<td>1.0 cr.</td>
<td>IMMU 7662. Current research and future directions in the field are discussed. Students are assessed via presentations, participation, and an exam.</td>
</tr>
<tr>
<td>IMMU 7603</td>
<td>Special Topics in Clinical Immunology</td>
<td>1.0 cr.</td>
<td>IMMU 7662, IMMU 7602. The course covers selected topics (8 in all) that encompass a wide range of topics in clinical immunology and will provide insight into immunologically – mediated human diseases and the prospect of new immuno-therapies. The format will include a presentation by the lecturer and a student presentation and class participation.</td>
</tr>
<tr>
<td>IMMU 7604</td>
<td>Special Topics in Signal Transduction in the Immune System</td>
<td>1.0 cr.</td>
<td>IMMU 7662, IMMU 7602. The course covers selected topics (8 in all) that encompass a wide range of topics in signal transduction through receptors important in the immune system. The format will include a presentation by the lecturer and a student presentation and class participation.</td>
</tr>
<tr>
<td>IMMU 7607</td>
<td>Science as a Profession</td>
<td>1.0 cr.</td>
<td>Dr. Marrack. This course will cover a wide variety of topics in ethical issues and for developing skills required for pursuing a career as an independent laboratory researcher.</td>
</tr>
<tr>
<td>IMMU 7650</td>
<td>Research in Immunology</td>
<td>Variable cr.</td>
<td>Consent of instructor. Research work in immunology.</td>
</tr>
<tr>
<td>IMMU 7662</td>
<td>Immunology</td>
<td>6.0 cr.</td>
<td>Dr. Riches, Dr. Marrack. The course includes the basic principles of the immune system as well as emphasis on the innate response, the adaptive response and the molecular and cellular basis of immune specificity.</td>
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**IMMUNOLOGY**

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<tbody>
<tr>
<td>IDPT 5600</td>
<td>Topics in Biomedical Science and Research</td>
<td>4.0 cr.</td>
<td>Dr. S. Flores. Research internship for undergraduate fellows in graduate experiences for multicultural scientists (GEMS) program.</td>
</tr>
<tr>
<td>IDPT 7200</td>
<td>Scientific Writing for Doctoral Students</td>
<td>2.0 cr.</td>
<td>Dr. D. Wilkerson. Scientific writing course for students engaged in research. Focuses on critical thinking, analytical writing, and oral presentation. Taught as a writing workshop, the course emphasizes effective communication with both professional and non-technical audiences.</td>
</tr>
<tr>
<td>IDPT 7300</td>
<td>Technology Transfer and Biotechnology</td>
<td>3.0 cr.</td>
<td>Dr. K. Newell - UCCS – 719-262-3256. The purpose of this course is to inform students about the process of technology transfer, from academic discovery and invention to commercialization of a product.</td>
</tr>
<tr>
<td>IDPT 7645</td>
<td>MSTP Seminar</td>
<td>1.0 cr.</td>
<td>Dr. A. Ribera - 303-315-8986. Designed to expose MSTP and physician scientist students to research programs and opportunities in biomedical sciences.</td>
</tr>
</tbody>
</table>
**IDPT 7646  Tissue Biology and Disease Mechanism**  3.0 cr.
This course provides an overview of organ systems and disease through 1) a survey of the major systems, including the cellular and molecular mechanisms underlying their function and repair, integrated with 2) common diseases, current therapies, and their mechanistic basis.

**IDPT 7650  Research in Biomedical Sciences**  Variable cr.
Faculty - 303-724-3742. Prereq: Consent of instructor.
Research work for students in the biomedical sciences Ph.D. program.

**IDPT 7651  MSTP Summer Research Rotation**  Variable cr.
Dr. A. Gutierrez-Hartmann - 303-315-8986. Prereq: Consent of instructor.
This course is an 8-10 week laboratory rotation experience in an MSTP training laboratory.

**IDPT 7801  Biomedical Sciences Core Course 1**  3.3 cr.
Faculty - 303-315-7928.
Unified presentation of fundamental principles of biochemistry, cell biology, genetics, and molecular biology.

**IDPT 7802  Biomedical Sciences Core Course 2**  3.3 cr.
Dr. R. Sclafani - 303-724-3271.
Unified presentation of fundamental principles of biochemistry, cell biology, genetics, and molecular biology.

**IDPT 7803  Biomedical Sciences Core Course 3**  3.3 cr.
Dr. K. Howell - 303-724-3468.
Unified presentation of fundamental principles of biochemistry, cell biology, genetics, and molecular biology.

**IDPT 7805  Case Studies: Molecules to Medicine**  5.0 cr.
This course is targeted for first year MSTP and Physician-Scientist students. Clinical cases will be presented and discussed by faculty and students to provide a clinical context for the basic science principles taught in the graduate core course (IDPT xx).

### MICROBIOLOGY

**MICB 7650  Research in Microbiology**  Variable cr.
Faculty - 303-724-4230. Prereq: Consent of instructor.
Research work in microbiology.

**MICB 7701  Molecular Virology and Pathogenesis**  3.0 cr.
Dr. J. Schaack - 303-724-4220. Prereq: IDPT 7803 or consent of instructor.
Molecular principles of viral pathogenesis. Topics include virus-host interactions, infectious diseases, cancer and virus replication.

**MICB 7702  Molecular Mechanisms of Bacterial Disease**  2.0 cr.
Dr. R. Gill - 303-724-4230. Prereq: IDPT 7803 or consent of the instructor.
Course will provide an introduction to the biology of pathogenic bacteria and an in-depth discussion of several paradigms of bacterial diseases which will illustrate important concepts and molecular mechanisms of bacterial pathogenesis and evasion of the host defenses. Topics will include attachment and entry of bacteria into host cells, bacterial toxins, avoidance of the immune response, and survival of bacteria within macrophages.

**MICB 7703  Contemporary Topics in Molecular Bacteriology**  1.0 cr.
Dr. R. Gill - 303-724-4230. Prereq: IDPT 7803 or consent of instructor.
A lecture and discussion course. Topics may include: biochemical and genetic control of the bacterial cell cycle, growth rate and cellular differentiation signal transduction and responses to environmental stimuli, genetic regulation of microbial pathogenesis.

**MICB 7704  Host Response to Infectious Disease**  2.0 cr.
Dr. L. VanDyk - 303-724-4224. Prereq: IDPT 7803 or consent of instructor.
This interactive graduate course, which provides an overview and specific examples of the host response to infectious disease. Current research and future directions in the field are discussed.

**MICB 7705  Medical Microbiology**  4.0 cr.
Dr. R. Gill - 303-724-4230. Prereq: Consent of instructor.
This lecture course introduces students to certain fundamental features of microorganisms and their ability to cause disease. Principal lecture topics include: molecular and cellular aspects of bacterial structure, physiology and genetics; specific properties of pathogenic bacteria, fungi and parasites, and the pathogenic mechanisms associated with these organisms; properties of viruses, their structure, classification and reproduction, and the diseases caused by viral agents.
### MOLECULAR BIOLOGY

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>MOLB 7616</td>
<td><strong>Topics in Molecular and Cellular Biology</strong></td>
<td>1.0 cr.</td>
<td>Dr. B. Banfield - 303-724-3245</td>
<td>Prereq: IDPT 7801, IDPT 7802, IDPT 7803. Various topics in molecular and cellular biology will be selected every year. Each topic will be studied by a faculty lecture and group presentations by graduate students of research papers.</td>
</tr>
<tr>
<td>MOLB 7661</td>
<td><strong>Molecular Biology Seminar</strong></td>
<td>1.0 cr.</td>
<td>Dr. J. Kieft - 303-724-3257</td>
<td>Seminar series provides a forum for the presentation of scientific experiments and information in molecular biology by faculty, postdoctoral fellows, graduate students and invited outside guest speakers.</td>
</tr>
<tr>
<td>MOLB 7800</td>
<td><strong>Advanced Topics in Molecular Biology</strong></td>
<td>4.0 cr.</td>
<td>Dr. H. Ford - 303-724-3509, Dr. L. Sussel - 303-724-3280</td>
<td>Prereq: IDPT 7801, IDPT 7802, IDPT 7803. This course is intended to teach graduate students how to critically evaluate the scientific literature. The course will be divided into 4 blocks, and topics will include nucleic acid, chromatin structure, DNA replication, RNA transcription, RNA processing, cell cycle control, and genetics of model organisms. Papers are chosen by instructors, presentations are by students.</td>
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</table>

### NEUROSCIENCE

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</thead>
<tbody>
<tr>
<td>NRSC 7600</td>
<td><strong>Cellular &amp; Molecular Neurobiology</strong></td>
<td>3.0 cr.</td>
<td>Dr. B. Wallace - 303-724-4532</td>
<td>Topics include ion channel structure and function, ionic basis of the resting and action potential, and the biochemistry and physiology of direct and indirect synaptic transmission.</td>
</tr>
<tr>
<td>NRSC 7605</td>
<td><strong>Directed Studies in Biomedical Science</strong></td>
<td>8.0 cr.</td>
<td>Dr. D. Restrepo - 303-724-3405</td>
<td>Unified presentation of fundamental principles of biochemistry, cell biology, genetics, and molecular biology. Students will take 80% of the lectures in IDPT 7801, IDPT 7802, IDPT 7803.</td>
</tr>
<tr>
<td>NRSC 7610</td>
<td><strong>Fundamentals of Neurobiology</strong></td>
<td>4.0 cr.</td>
<td>Dr. T. Finger - 303-724-3120</td>
<td>Prereq: NRSC 7600 or consent of instructor. This course will provide basic knowledge on the structure and function of the nervous system. The lectures will be supplemented by discussion of primary research literature in neurobiology.</td>
</tr>
<tr>
<td>NRSC 7614</td>
<td><strong>Molecular Basis of Neuro-psychiatric Disorders</strong></td>
<td>2.0 cr.</td>
<td>Dr. S. Leonard - 303-724-3120</td>
<td>Prereq: IDPT 7802 or BMGN 5000 or CSBI 5001. This elective, provides a survey of the current clinical and molecular aspects of human neuro-psychiatric disorders. Both movement disorders and DSMIV diagnoses will be covered. Contact Course Director for a list of topics</td>
</tr>
<tr>
<td>NRSC 7615</td>
<td><strong>Developmental Neurobiology</strong></td>
<td>3.0 cr.</td>
<td>Dr. A. Ribera - 303-724-3120</td>
<td>Prereq: IDPT 5004, NRSC 7600, NRSC 7610. This course will cover fundamental principles regarding development of the nervous system. The format of the course will consist of lecture plus reading of primary literature.</td>
</tr>
<tr>
<td>NRSC 7661</td>
<td><strong>Grant Proposal Writing Workshop</strong></td>
<td>1.0 cr.</td>
<td>Dr. R. Levinson - 303-724-3120</td>
<td>Prereq: NRSC 7610 and consent of instructor. This course will be a practical workshop in grant-writing culminating in a mock review panel including the course participants. Students will examine various proposal types and formats, and then write their own proposal in the format of an NRSA fellowship application. All proposals will be reviewed and critiqued at the end of the semester. Three day intensive. Meeting dates decided at organizational meeting.</td>
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<tr>
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<tr>
<td>NRSC 7670</td>
<td>Advanced Topics in Neuroscience</td>
<td>Variable cr.</td>
<td>D. Restrepo – 303-724-3405.</td>
<td>Prereq: NRSC 7600 and consent of instructor. The course will consist of discussion of manuscripts relevant to a specific topic in neuroscience.</td>
</tr>
<tr>
<td>PHCL 7560</td>
<td>Drug Metabolism &amp; Pharmacogenetics 1</td>
<td>1.0 cr.</td>
<td>V. Vasiliou - 303-315-6153.</td>
<td>Crosslisted: TXCL 7560. This course will focus on the reactions that the exogenous compounds undergo in mammalian systems and the mechanisms of these reactions. Enzyme kinetics and unusual (idiosyncratic) drug responses that have a hereditary basis will be discussed. The interrelationship between genes and drug metabolism along with studies on polymorphic differences in genes encoding drug-metabolizing enzymes will also be discussed.</td>
</tr>
<tr>
<td>PHCL 7561</td>
<td>Drug Metabolism and Pharmacogenetics 2</td>
<td>2.0 cr.</td>
<td>D. Petersen - 303-315-6159.</td>
<td>Crosslisted: TXCL 7561. This interdisciplinary course is designed to provide the student with current information on the basic concepts of xenobiotic and drug metabolism pathways. Major emphasis is placed on the relationship of inter-individual differences in the metabolism of therapeutic agents to pharmacologic response and toxicity.</td>
</tr>
<tr>
<td>PHCL 7600</td>
<td>Frontiers in Pharmacology</td>
<td>1.0 cr.</td>
<td>T. Kutateladze - 303-724-3593.</td>
<td>This course introduces students to cutting-edge pharmacology research and to the range of research opportunities available within the pharmacology training program. A series of presentations of the faculty members of the pharmacology department will focus on cellular signaling, molecular mechanisms of drug actions and structure-based drug design.</td>
</tr>
<tr>
<td>PHCL 7605</td>
<td>Ethics in Research</td>
<td>1.0 cr.</td>
<td>J. Stevens - 303-724-3385.</td>
<td>An interactive course designed to inform and sensitize students, trainees and faculty to the problems of fraud, misconduct and unethical practices in scientific research.</td>
</tr>
<tr>
<td>PHCL 7606</td>
<td>Receptors and Cell Signaling</td>
<td>3.0 cr.</td>
<td>M. Dell'Acqua - 303-724-361.</td>
<td>Prereq: IDPT 7801, IDPT 7803. This elective course presents an in-depth treatment of the role of receptors and signal transduction systems in the regulation of cell functions through faculty-presented lectures and student-led discussions of current literature.</td>
</tr>
<tr>
<td>PHCL 7609</td>
<td>Statistical Methods in Pharmacology</td>
<td>2.0 cr.</td>
<td>L. Hines, D. Osguthorpe - 303-724-3385.</td>
<td>This introductory course is designed to provide students in the biological and health sciences with the knowledge and skills to analyze and interpret data.</td>
</tr>
<tr>
<td>PHCL 7610</td>
<td>Survey of Bioinformatics Methods</td>
<td>2.0 cr.</td>
<td>L. Hunter - 303-315-6873.</td>
<td>Crosslisted: BIOI 7710. Prereq: Same as BIOI 7710. What is Bioinformatics and why study it? How is large-scale molecular biology data generated, where and how can researchers gain access to it, and what computational analyses are possible?</td>
</tr>
<tr>
<td>PHCL 7611</td>
<td>Bioinformatics 1</td>
<td>4.0 cr.</td>
<td>L. Hunter - 303-315-6873.</td>
<td>Crosslisted: BIOI 7711. Prereq: Consent of instructor. What is Bioinformatics and why study it? How is large-scale molecular biology data generated, where and how can researchers gain access to it, what computational analyses are possible and computational techniques for solving inference problems in molecular biology?</td>
</tr>
<tr>
<td>PHCL 7612</td>
<td>Bioinformatics 2</td>
<td>4.0 cr.</td>
<td>L. Hunter - 303-315-6873.</td>
<td>Crosslisted: BIOI 7712. Prereq: BIOI 7711, Ph.D. student. Inference problems and computational techniques for molecular biology, with emphasis on machine learning approaches. Use of computational induction techniques focused on information extraction from biomedical literature, inference of biochemical networks from high-throughput data, and prediction of protein function.</td>
</tr>
<tr>
<td>PHCL 7614</td>
<td>Membrane Biophysics</td>
<td>2.0 cr.</td>
<td>T. Benke - 303-315-2925.</td>
<td>Lectures and homework on ionic mechanisms underlying cellular excitability, especially in the central nervous system. Descriptive mathematics, pharmacology and molecular biology will be stressed. Course to utilize major textbooks as a course outline. An introductory application to real-life problems using the NEURON simulation environment will be taught.</td>
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<tr>
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<tr>
<td>PHCL 7620</td>
<td>Principles of Pharmacology</td>
<td>6.0 cr.</td>
<td>Faculty - 303-724-3385. Prereq: IDPT 7801, IDPT 7802, IDPT 7803. Lectures are provided in the general areas of pharmacokinetics, receptor theory, structure-activity relationships, drug metabolism, and basic pharmacological mechanisms with a particular emphasis on systems such as the nervous system and cardiovascular system, as well as cancer and microbial chemotherapy.</td>
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<tr>
<td>PHCL 7622</td>
<td>Graduate Pharmacology for MSTP Students</td>
<td>1.0 cr.</td>
<td>Faculty - 303-724-3385. Prereq: IDPT 7801, IDPT 7802, IDPT 7803, PHCL 6000. Lectures are provided in the general areas of pharmacokinetics, receptor theory, structure-activity relationships, drug metabolism, and basic pharmacological mechanisms with a particular emphasis on systems such as the nervous system and cardiovascular system, as well as cancer and microbial chemotherapy.</td>
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<tr>
<td>PHSC 7325</td>
<td>Pharmaceutical Development: Evaluating the External Environment</td>
<td>2.0 cr.</td>
<td>Dr. R. Valuck - 303-315-3841. An overview of the pharmaceutical industry in the United States and the environment (context) in which it exists. Material to be covered will include: epidemiology and classification of disease; trends in health care costs and expenditures; organization and financing of health care; characteristics of the pharmaceutical industry; drug product marketing and an introduction to pharmaceutical outcomes and economics.</td>
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<tr>
<td>PHSC 7339</td>
<td>Human Subjects Ethics</td>
<td>1.0 cr.</td>
<td>Dr. Prochazka - 303-315-0565. Crosslisted: CLSC 7150. Prereq: Graduate degree in clinical science or consent of instructor. This course will provide an overview of the field of ethics in clinical research and is designed for students who will be conducting research involving human subjects. Attendance at IRB sessions for CLSC Ph.D. and certificate students enrolled is required.</td>
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<tr>
<td>PHSC 7345</td>
<td>Principles of Drug Delivery</td>
<td>2.0 cr.</td>
<td>Dr. L. Ng - 303-315-6997. The course will introduce students to the basic principles that are fundamental to drug delivery with a special emphasis on targeted drug delivery. It is expected students will gain an understanding of the physiological as well as physical means of delivering drug substances in vivo.</td>
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<tr>
<td>PHSC 7350</td>
<td>Protein Chemistry 1</td>
<td>2.0 cr.</td>
<td>Dr. J. Carpenter - 303-315-6075. This course will provide the chemical and physical bases for protein structure, folding, function and stability. Students will be expected to demonstrate an understanding of the mechanisms of protein folding and structure and an ability to devise strategies for stabilizing protein molecules.</td>
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<tr>
<td>PHSC 7354</td>
<td>Structural Analysis of Bio-molecules 1</td>
<td>2.0 cr.</td>
<td>Faculty - 303-315-0565. Crosslisted: BMST 7354. Fundamentals of spectroscopic methods used to study protein structure and function. These techniques include optical methods (CD spectroscopy, fluorescence and absorbance), vibrational methods (IR and ESR), analytical ultracentrifugation, mass spectrometry, calorimetry, light scattering and Biacore analysis.</td>
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<tr>
<td>PHSC 7400</td>
<td>Ethical Issues in Toxicology &amp; Pharmaceutical Sciences</td>
<td>1.0 cr.</td>
<td>Dr. R. Agarwal - 303-315-1381. Crosslisted: TXCL 7400. The purpose of this course is to expose students to ethical issues in the fields of toxicology and pharmaceutical sciences. Emphasis will be placed on research conduct, animal use, and other timely issues relevant in these fields.</td>
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<tr>
<td>PHSC 7450</td>
<td>Protein Chemistry 2</td>
<td>2.0 cr.</td>
<td>Dr. J. Carpenter - 303-315-6075. Crosslisted: BMST 7450. Methods and principles of protein/peptide purification and enzyme catalysis, including electron transfer and mutagenesis. In addition, the investigation of protein and enzyme structure/function, the role of molecular dynamics, and the use of molecular stimulations in investigations of protein-ligand interactions will be presented.</td>
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</table>
PHSC 7454  **Structural Analysis of Bio-molecules 2** 2.0 cr.  
Faculty - 303-315-0565.  Crosslisted: BMST 7454.  
Methods and strategies for determination of the primary and 3-dimensional structures of biologically important molecules. Crystallography, nuclear magnetic resonance spectroscopy and mass spectrometry will be taught in structural determination of proteins, nucleic acids complex carbohydrates, and lipid molecules.

PHSC 7530  **Cancer: Experimental and Medical Aspects** 2.0 cr.  
Dr. A. Malkinson - 303-315-4579.  Prereq: Consent of instructor.  
This is an interactive seminar course on recent topics in cancer biology. Topics include the biochemical and morphological description of tumors and tumor behavior, such as metastasis and angiogenesis, and tumor development. This course also covers aspects of carcinogenesis: mechanisms, modulation, testing and epidemiology, and chemotherapy.

PHSC 7561  **Pharmacology of Anticancer Agents** 2.0 cr.  
Dr. D. Gustafson - 303-315-0755.  
This is a course that will examine the principles behind the pharmacological treatment of cancer. Focus will be on the agents currently used in the clinic as well as developing therapies. Mechanistic aspects and therapeutic strategies will also be emphasized.

PHSC 7568  **Seminar in the Pharmaceutical Sciences** Variable cr.  
Faculty - 303-315-0565.  
Discusses current literature and research in the pharmaceutical sciences. The only revision for this course is that the maximum credit hours possible will be three.

PHSC 7650  **Research Rotation Pharmaceutical Sciences** Variable cr.  
Faculty - 303-315-0358.  Prereq: Consent of instructor.  
Research work in pharmaceutical sciences.

PHSC 7651  **Pharmaceutical Biotechnology** 3.0 cr.  
Dr. T. Randolph - 303-315-0565.  Crosslisted: CU Boulder CHEN 5900.  
This course covers the role of bioengineering in the development of pharmaceutical biotechnology products. In particular, the student will learn to apply solution thermodynamics as well as mass and heat transfer concepts to the stabilization and formulation of macromolecules and production of drug delivery systems.

PHSC 7652  **Principles of Medicinal Chemistry** 2.0 cr.  
Dr. J. Ruth - 303-315-7569.  Prereq: One-year organic chemistry with lab.  
This survey course covers the organic chemistry of drugs with respect to drug action: mechanism of action, structure-activity relationships, metabolism, dosage forms and rational drug design. The course will encompass traditional therapeutic categories of drugs as well as selected topics from the current literature.

PHSC 7653  **Protein Formulation** 2.0 cr.  
Dr. J. Carpenter - 303-315-6075.  
This course will provide instruction in rational design of stable therapeutic protein formulations with emphasis on the practical and mechanistic aspects of developing aqueous solution and freeze-dried formulations. Students will read papers from the literature and participate in critical discussions.

PHSC 7654  **Advanced Topics in Pharmacology** Variable cr.  
Faculty - 303-315-0358.  
Considers special topic of current interest in pharmacology.

PHSC 7655  **Adv. Topics in Medicinal Chemistry** Variable cr.  
Dr. J. Ruth - 303-315-0358.  Prereq: Consent of instructor.  
Considers special topic of current interest in pharmaceutical sciences.

PHSC 7656  **Adv. Topics in Pharmaceutical Sciences** Variable cr.  
Faculty - 303-315-6845.  
Considers special topic of current interest in pharmaceutical sciences.

PHSC 7660  **Membrane Dynamics** 2.0 cr.  
Dr. T. Anchordoquy - 303-315-0358.  
This course will cover the basics of membrane bioenergetics in biological systems. The physical properties of membranes are described based on studies with liposomes, and the course further explores the use of liposomes as drug delivery.

PHSC 7831  **Case Studies in Biotechnology** 2.0 cr.  
This course is required of all graduate students in the interdisciplinary graduate biotechnology certificate program and those supported on NIH training grants. Reviews molecular genetics, product synthesis and purification, economics, intellectual property, and business planning. Working in teams, students present a biotechnology product plan.
PHSC 8990  Doctoral Thesis  Variable cr.
Faculty - 303-315-0358.
Doctoral thesis work in pharmaceutical sciences.

PHSL 7650  Research in Physiology and Biophysics  Variable cr.
Faculty – 303-724-4531. Prereq: Consent of instructor.

PHSL 7840  Advanced Topics in Cell Signaling  1.0 cr.
Dr. N. Schoppa – 303-724-4523. Prereq: Consent of instructor.
Students select topics of interest in the area of cell signaling and receive one-on-one instruction from expert
faculty. Each one-credit topic will be taught for 5 weeks. Course work will include reading and discussing papers, as well as practical exercises.

PHSL 8990  Doctoral Thesis  Variable cr.
Faculty - 303-724-45311.
Doctoral thesis work in physiology.

PREVENTIVE MEDICINE

PRMD 6600  Introduction to Public Health  Summer Sem.  2.0 cr.
Dr. K. Kennedy – 303-315-8359
This course examines the historical and conceptual basis of public health, the key issues and problems
faced by the public health system, and the tools available for the protection and enhancement of the public's health.

PRMD 6602  Healthy People 2010  Summer Sem.  1.0 cr.
Dr. C. DiGuiseppi – 303-315-8359
The student will understand the development of Healthy People 2010, its organization and content, compare
ways that different states use Healthy People 2010 and critically analyze a focus area or objective.

PRMD 6603  Health Care Systems  Fall Sem.  2.0 cr.
Dr. P. Barton – 303-315-8359
This is the first of a two-semester sequence designed to introduce students to the U.S. health care system
from an organizational, service delivery, social, and political perspective. Students are introduced to the basic
components of the current health care system (personnel, organizations, facilities) and basic economic principles as
they are applied to selected aspects of the health care system (financing, insurance, Medicare, Medicaid).

PRMD 6604  Health Care Economics  Spring Sem.  2.0 cr.
This course is a sequel to PRMD 6603 and focuses on health care financing and economic issues. A
microeconomics framework, including issues of supply, demand, market structure, market failure, price and output are
discussed as they apply to the health sector. Specialized markets, the role of the government in regulating and/or
fostering competition, and the significance of health insurance in financing the US health care system are addressed.

PRMD 6605  Health Policy  Spring Sem.  2.0 cr.
J. Glazner – 303-315-8359 Prereq: PRMD 6603
The focus of this course will be the analysis of important U.S. health policy issues, such as access, cost,
quality and other timely health policy topics. Analytic concepts, approaches, and frameworks will be used to explore
specific significant health policy issues.

PRMD 6606  Community Health Practice: Administration Policies and Politics  Fall/Spring Sem.  3.0 cr.
Faculty – 303-315-8359 Prereq: PRMD 6603 and PRMD 6604 or PRMD 6603 and PRMD 6605.
This course is designed to present technical, policy and administrative issues within the context of operational
activities of community and public health agencies. An introduction to basic management skills is included. Each student
will participate in a community agency problem solving or needs assessment activity. The course provides each student
with a practicum experience in a community health agency in the Denver area.

PRMD 6607  Current Legal Issues in Health Care  Spring Sem.  2.0 cr.
D. Matthew – 303-315-8359
This elective will explore American health care policy. We will begin with an overview of the current
public/private system of health care in the U.S., with some consideration of the historical developments that have led to
our current system. By way of comparison, we will briefly consider alternative approaches in the Canadian system and
the UK, just to understand the concept of “socialized medicine”. Next we will consider the difficult issues raised by our
system. Issues of unequal access, double digit cost inflation and variable quality will occupy our discussion. Particular
emphasis will be placed on the provider's role in addressing issues of justice in health care delivery and the legal tools
available to policy makers.
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<th>Course Code</th>
<th>Course Title</th>
<th>Type</th>
<th>Credits</th>
<th>Instructor(s)</th>
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<tbody>
<tr>
<td>PRMD 6608</td>
<td>Ethical and Legal Issues in Public Health, Health Policy, Epidemiology</td>
<td>Varied/elective</td>
<td>2.0</td>
<td>Dr. J. Glover – 303-315-8359</td>
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<td>This course will explore the ethical and legal dimensions of various topics of concern in the areas of public health, health policy, and epidemiology. The following are some of the topics which will be covered: health care reform and medical indigence, screening and genetic screening, epidemiological research, QUALYS and health outcomes research, public health and individual rights, and public health in developing countries.</td>
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<tr>
<td>PRMD 6609</td>
<td>Cost Benefit and Effectiveness in Health</td>
<td>Varied/elective</td>
<td>3.0</td>
<td>Dr. S. Eisert – 303-315-8359</td>
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<td>This is an intermediate level course on the theory, methods and application of economic evaluation in the health context. “Economic evaluation” includes cost analysis, cost benefit analysis (CBA), cost effectiveness analysis (CEA), and cost utility analysis (CUA). The learning objectives of this course are (1) to develop an understanding of the theoretical underpinnings of economic evaluation; (2) to learn how to critically examine completed economic evaluations; (3) to learn how different types of economic evaluations are carried out in practice. Students are required to conduct an economic evaluation by collecting data and information related to a health program of interest.</td>
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<tr>
<td>PRMD 6610</td>
<td>Social and Community Factors in Health</td>
<td>Spring Sem.</td>
<td>3.0</td>
<td>Dr. J. Swift – 303-315-8359</td>
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<td>This course considers the social and community factors affecting health status, and factors related to seeking and providing health care. Cross-cultural concepts of health and disease are reviewed. The measurement of selected social and psychological factors, including demographic, socioeconomic and life style indicators and their use in epidemiological studies are emphasized.</td>
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<tr>
<td>PRMD 6611</td>
<td>Scientific Basis of Health Promotion: Intervention Strategies</td>
<td>Varied/elective</td>
<td>2.0</td>
<td>Dr. L. Crane – 303-315-8359</td>
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<td>The scientific basis for planning behavioral interventions in populations. Changing patterns of health related behaviors during the 20th century will be reviewed in relation to morbidity and mortality data for chronic diseases. These patterns will serve as springboards for the development of a health promotion planning model that requires selection of intervention strategies based on accepted criteria. Major behavioral intervention strategies will be discussed. The course will focus on the actual planning, implementation and evaluation of behavioral intervention programs.</td>
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<tr>
<td>PRMD 6612</td>
<td>Program Evaluation</td>
<td>Varied/elective</td>
<td>2.0</td>
<td>Dr. L. Crane – 303-315-8359</td>
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<td>Provides students with an understanding of the role of systematic evaluation in assessing effectiveness of public health programs and policies. Includes theoretical concepts and methodology. Topics to be examined include: needs assessment, process and outcome evaluation, qualitative and quantitative research designs, and data collection methodologies.</td>
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<tr>
<td>PRMD 6614</td>
<td>Occupational and Environmental Health</td>
<td>Spring Sem.</td>
<td>3.0</td>
<td>Drs. J. Ruttenber and J. Litt - 303-315-8359</td>
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<td>Prereq: PRMD 6630 or permission of the instructor. Presenting an overview of information needed to assess the relationship between the environment/workplace and health. Topics include facets of industrial hygiene, air and water pollution, radiation monitoring, toxicology studies, clinical occupational medicine, and biologic monitoring. The emphasis throughout is on the epidemiologic link between exposure and health with a discussion of study methods and interpretation specific to the areas.</td>
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<td>PRMD 6615</td>
<td>Topics in Occupational/Environmental Medicine: A Problem-based Approach</td>
<td>All Sems.</td>
<td>2 - 3</td>
<td>Dr. K. Mueller – 303-315-8359</td>
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<td>Prereq: PRMD 6614 and PRMD 6630. Students are presented with a series of problems, which focus on industries and environmental problems in the Denver metropolitan area. The solutions to the problems involve visiting industries, consulting with experts, and learning the principles and practice of toxicology, industrial hygiene, and occupational epidemiology. Different problems offered each semester.</td>
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<tr>
<td>PRMD 6617</td>
<td>Introduction to Health Services Research</td>
<td>Varied/elective</td>
<td>2.0</td>
<td>Dr. P. Barton 303-315-8359</td>
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<td>Prereq: PRMD 6603 and 6604 or PRMD 6603 and 6605. A review of a number of health care issues and the ways in which various national health care systems are organized or have evolved to deal with these issues. Several contrasting national health care systems will be reviewed in depth. The role of governmental, multi-governmental, philanthropic, voluntary and industrial organizations in the international health area will be examined. Particular attention is given to primary health care in developing countries.</td>
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<tr>
<td>PRMD 6619</td>
<td>Perspectives in International Health</td>
<td>Varied/elective</td>
<td>2.0</td>
<td>Faculty – 303-315-8359</td>
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<td>A review of a number of health care issues and the ways in which various national health care systems are organized or have evolved to deal with these issues. Several contrasting national health care systems will be reviewed in depth. The role of governmental, multi-governmental, philanthropic, voluntary and industrial organizations in the international health area will be examined. Particular attention is given to primary health care in developing countries.</td>
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PRMD 6620  Questionnaire Design   Varied/elective   1.0 cr.
Dr. L. Crane – 303-315-8359
This course examines survey research methodology, including the use of face-to-face, telephone and self-administered questionnaires. Topics include: methods of data collection; developing and ordering questions; formatting; determining reliability and validity; methods of sampling; implementation; maximizing response rate; data issues; and reporting.

PRMD 6621  Maternal and Child Health   Varied/elective   1.0 cr.
Faculty - 303-315-8359
This course introduces students to several current issues in maternal and child health such as electronic fetal monitoring, well child care, accidents, adolescent pregnancy, child abuse, chronic illness and child advocacy.

PRMD 6622  Cancer Prevention and Control   Summer Sem.   2.0 cr.
Dr. T. Byers – 303-315-8359 Prereq: PRMD 6630, PRMD 6626.
This course will provide an overview of preventable cancers, epidemiology and contributing factors. Phases of cancer control research and appropriate methodologies will be discussed. Basic principles of intervention development will be reviewed. Psychosocial issues related to cancer will be discussed. Students will research topic related to course.

PRMD 6624  Community Diagnosis   Varied/elective   3.0 cr.
Community diagnosis provides the means of assessing the social, economic, physical, and environmental status of a community, as these factors affect the health of its population. Students will learn to use national and local demographic and health data resources.

PRMD 6625  Methods in Health Services Research   Varied/elective   3.0 cr.
Drs. A. Beck and D. Magid – 303-315-8359 Prereq: BIOS 6601, 6680, PRMD 6603, 6617, 6626, 6630 and corequisites PRMD 6631.
This course provides an overview of research methods in health services. It covers the topics of risk assessment, cost assessment, access to, utilization and quality of care; outcomes and health status measurement, and health system performance. This class is designed for individuals who have completed the MSPH prerequisites and who have taken or are taking PRMD 6631.

PRMD 6626  Research Methods in Community Health   Spring Sem.   3.0 cr.
Dr. D. Lezotte – 303-315-8359 Prereq: BIOS 6601 and PRMD 6630, BIOS 6680.
Research methods topics include: cohort and case control studies, clinical trials, medical care evaluation, and survey research. Lectures and discussions cover problem statement and hypothesis formulation, study design, data collection and analysis. Students will gain practical experience through analysis of large data sets available from state agencies.

PRMD 6628  Seminar Series in Preventive Medicine   Fall/Spring Sem.   1.0 cr.
Dr. C. DiGuiseppi – 303-315-8359
This seminar series is designed to present recent important findings in preventive medicine and biometrics. Different topics presented twice a month (except summer months) in departmental grand rounds and seminar presentations by Department of Preventive Medicine and Biometrics faculty and invited guest speakers.

PRMD 6629  Clinical Epidemiology: Studies in Diagnosis, Prognosis and Treatment   Summer Sem.   1.0 cr.
Faculty – 303-315-8359
This course provides an overview of the design, conduct, and appraisal of clinical research. Topics include choice of study design, issues in randomized trials (bias, measurement, validity), assessment of diagnostic tests, functional status measurement, meta-analysis, and use of questionnaires.

PRMD 6630  Epidemiology   Fall Sem.   4.0 cr.
Dr. R. Hamman – 303-315-8359 Prereq: Permission of the instructor if non-degree student.
Offers an introduction to the 1) approaches and methods used in describing the natural history of disease in the community and for locating clues to the causes of disease, and 2) analytical epidemiology (study design, bias, confounding and measures of excess risk) used in the study of disease etiology and the critical review of the medical literature. Lectures/discussions are supplemented with problem-solving exercises.

PRMD 6631  Analytical Epidemiology   Fall Sem.   2.0 cr.
Dr. J. Hokanson – 303-315-8359 Prereq: PRMD 6630, BIOS 6601.
This course emphasizes the analytical foundations of epidemiology and its application to etiologic studies and public health practice. Topics include determining rates of disease occurrence, assessing exposure disease relationships, stratified analysis, measurement error and sampling. Final project requires analysis and interpretation of epidemiologic data.
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<tr>
<td>PRMD 6632</td>
<td>Advanced Epidemiology</td>
<td>Spring</td>
<td>2.0 cr.</td>
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<td>Dr. J. Marshall 303-315-8359 Prereq: PRMD 6630, PRMD 6631, BIOS 6601</td>
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<td>This is a course on epidemiologic methods designed to improve the student's ability to conduct and interpret epidemiologic studies including intervention studies, cohort studies and case control studies. Principles and methods related to causal inference, selection of subjects and appropriate comparison groups, measurement of the exposures and outcomes of interest, and estimating the magnitude and likely range of the effect of interest will be emphasized.</td>
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<tr>
<td>PRMD 6635</td>
<td>Epidemiology of Communicable Disease</td>
<td>Varied/elective</td>
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<td>Dr. C. Nyquist 303-315-8359 Prereq: PRMD 6630.</td>
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<td>This course considers the epidemiology of selected communicable diseases. Methods for their prevention and control, and assessment of these methods will be treated primarily through case studies.</td>
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<td>PRMD 6636</td>
<td>Chronic Disease Epidemiology</td>
<td>Varied/elective</td>
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<td>Dr. D. Dabelea 303-315-8359 Prereq: PRMD 6630.</td>
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<td>The major chronic diseases of Western countries will be reviewed including heart disease, cancer, stroke, diabetes, neurological diseases, and selected other conditions. Basic science topics relevant to diseases discussed are included. Factual information about epidemiology of these diseases will be provided with the discussion of methodological issues which arise.</td>
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<td>PRMD 6637</td>
<td>Injury Epidemiology and Control</td>
<td>Varied/elective</td>
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<td>D. C. DiGuiseppi -303-315-8359</td>
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<td>Major causes of injuries in the U.S. will be reviewed. This will include motor vehicle traffic injuries, other unintentional injuries (including occupational injuries) and intentional injuries. The major components of injury control will be discussed – acute care, biomechanics, epidemiology and surveillance, prevention and rehabilitation. Introduction to research methods specific to the study of injuries will also be incorporated into the course.</td>
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<tr>
<td>PRMD 6638</td>
<td>Cardiovascular Epidemiology</td>
<td>Varied/elective</td>
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<td>Dr. J. Hokanson 303-315-8359 Prereq: PRMD 6630.</td>
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<td>This course provides a practical introduction to the current concepts, research method and unanswered questions in epidemiology of coronary artery disease, stroke and peripheral artery disease. It prepares students for independent work in academic and nonacademic settings in the area of cardiovascular disease surveillance, etiology and outcome research.</td>
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<td>PRMD 6639</td>
<td>Genetic and Molecular Epidemiology</td>
<td>Varied/elective</td>
<td>2.0 cr.</td>
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<td>Dr. J. Norris – 303-315-8359 Prereq: PRMD 6630, BIOS 6601</td>
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<td>This course reviews basic genetic principles and teaches epidemiologic methods employed in the investigation of the genetic susceptibility to chronic disease. This course also covers the methods, uses, and limitations of modern molecular technologies applied to epidemiological problems.</td>
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<td>PRMD 6643</td>
<td>The Nuclear West</td>
<td>Fall</td>
<td>2.0 cr.</td>
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<td>Dr. J. Ruttenber – 303-315-8359.</td>
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<td>Drawing on the expertise of the instructors, this interdisciplinary seminar will examine historical nuclear issues in the West from the perspectives of natural science, epidemiology and the news media. The topic for each session will be addressed from a matrix of issues, as described in the following course schedule, although the emphasis will vary depending on the main topic of the day.</td>
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<td>PRMD 6645</td>
<td>Critical Reading Seminar</td>
<td>Varied/elective</td>
<td>1.0 cr.</td>
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<td>Dr. R. Hamman – 303-315-8359 Prereq: PRMD 6630 &amp; 6626; BIOS 6601.</td>
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<td>Through informal reading and discussion of current articles in the medical literature, students will present journal summaries, lead small group discussion of an article, identify potential sources of bias in the design and conduct of published research, and suggest alternate research designs or analyses.</td>
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<tr>
<td>PRMD 6651</td>
<td>Research Paper</td>
<td>All sems.</td>
<td>1 - 4 crs.</td>
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<td>Faculty - 303-315-8359 Prerequisites PRMD 6626, 6630, BIOS 6601, 6680.</td>
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<td>An independent research project is required of all students as a final demonstration of acquired skills and knowledge. Students have the opportunity to organize, synthesize and communicate the results of the project both through an oral defense and in a written report. It is anticipated that all projects will involve the analysis of quantitative data. Students have the option of completing the written report in the form of either a thesis or a publishable research paper.</td>
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<tr>
<td>PRMD 6670</td>
<td>Topics in Preventive Medicine</td>
<td>All Sems.</td>
<td>1 - 3 crs.</td>
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<td>Faculty - 303-315-8359</td>
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<td>Special interest areas of current preventive medicine research and controversy are analyzed in depth. The course format is lecture and discussion or seminar.</td>
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<td>PRMD 6680</td>
<td>Research in Preventive Medicine</td>
<td>All Sems.</td>
<td>1 - 3 crs.</td>
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<td>Faculty – 303-315-8359 Prereq: PRMD 6626, 6630, BIOS 6601, 6680.</td>
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<td>Resources of the department are available to those students who elect to carry out research in chosen topics. A faculty member will provide guidance throughout the project.</td>
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PRMD 6910  Field Practicum  All Sems.  1 - 3 crs.
Faculty – 303-315-8359
Students may work in state and local health departments or industry. Students can participate in ongoing
studies in chronic and infectious disease epidemiology, environmental health and community health planning, or develop
their own project in conjunction with a preceptor. Emphasis is on actual experience and may involve travel and extra
hours work.

PRMD 6950  Master’s Thesis  All Sems.  1 - 3 crs.
Faculty - 303-315-8359. Prereq.: PRMD 6626, 6630, BIOS 6601, BIOS 6680.
An independent research project is required of all students as a final demonstration of acquired skills and
knowledge. Students have the opportunity to organize, synthesize and communicate the results of the project both
through an oral defense and in a written report. It is anticipated that all projects will involve the analysis of quantitative
data. Students have the option of completing the written report in the form of either a thesis or a publishable research
document.

PRMD 7600  Topics in Epidemiology and Biometrics  All Sems.  1 - 4 crs.
Dr. J. Hokanson – 303-315-0862. Consent of instructor is required.
Special interest areas of current epidemiologic research and biomedicine are analyzed in depth.

PRMD 7911  Epidemiologic Field Methods  All Sem.  1 - 4 crs.
Dr. J. Hokanson – 303-315-0862. Prereq.: PRMD 6626, 6630, 6631, 6632, BIOS 6611, 6612. Permission of instructor is
required.
Ph.D. students have the opportunity to work with faculty on current epidemiologic projects to develop skills in
field research, proposal writing, budget development, staff hiring and training, protocol and instrument development
and implementation, and specific methods topics.

PRMD 7915  Analytic Methods in Epidemiology  All Sem.  1 - 4 crs.
Dr. J. Hokanson – 303-315-0862. Prereq: PRMD 6626, 6630, 6631, 6632, or equiv. BIOS 6611, 6612.
Permission of instructor is required.
Advanced treatment of techniques in the analysis of epidemiological studies, including longitudinal, time-
dependent, survival data, causality, missing data, etc. Students will analyze data sets currently on file using
contemporary epidemiological methods.

PRMD 8990  Doctoral Dissertation  All Sems.  Variable cr.
Faculty – 303-315- 0862. Prereq: Consent of the instructor.

TOXICOLOGY

TXCL 7322  Molecular and Target Organ Toxicology  3.0 cr.
Dr. D. Ross - 303-315-6077.  Prereq: Discussion with and consent of Instructor.
The course is designed to provide a foundation in molecular mechanisms of toxicity. Biochemical mechanisms
underlying toxicity will be analyzed and integrated with discussions of reactive metabolites, oxidative stress, signal
transduction, cell death and organ specific toxicity.

TXCL 7323  Environmental and Target Organ Toxicology  2.0 cr.
Dr. D. Petersen - 303-315-1938.  Prereq: Consent of instructor.
The course is designed to provide a fundamental understanding of environmental-related toxicants (e.g.
solvents, pesticides, metals, radiation) with emphases on the molecular mechanisms underlying their organ specific
toxicity and on risk assessment.

TXCL 7325  Current Topics in Toxicology Research  1.0 cr.
Dr.C. Ju - 303-315-2180.
This is a mandatory course for toxicology students. The course will meets bi-weekly and consists of research seminars
and student research paper discussions. Each student is expected to lead one discussion per year, and the papers
discussed will authored by the upcoming toxicology seminar series speaker.

TXCL 7326  Current Concepts & Comprehensive Review of Physiology  4.0 cr.
Dr. R. Radcliffe - 303-315-1597.
This course will consist of a comprehensive overview of the physiology of the nervous cardiovascular, respiratory, renal,
gastrointestinal, endocrine, and reproductive systems. Students enrolled in this course will receive assignments
concerning organ-specific, cell-cell interactions in overall physiology.

TXCL 7330  Issues in Drug Development  2.0 cr.
A multidisciplinary approach to educating students about all aspects of drug development including federal drug
regulatory issues, natural product screening, combinatorial chemistry, high throughput screening, in vitro and in vivo
pharmacology models, preclinical and clinical toxicology, dosage forms, and clinical trials design. Preparation for careers
in the pharmaceutical industry and drug development process.
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<tr>
<td>TXCL 7400</td>
<td>Ethical Issues in Toxicology &amp; Pharm Sciences</td>
<td>1.0 cr.</td>
<td>Dr. R. Agarwal, 303-315-0755. The purpose of this course is to expose students to ethical issues in the fields of Toxicology and Pharmaceutical Sciences. Emphasis will be placed on research conduct, animal use, and other timely issues relevant in these fields.</td>
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<tr>
<td>TXCL 7475</td>
<td>Advanced Topics in Toxicology</td>
<td>Variable cr.</td>
<td>Faculty - 303-315-6153. Prereq: Consent of instructor. Considers special topic of current interest in toxicology.</td>
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<tr>
<td>TXCL 7555</td>
<td>Evidenced-Based Toxicology</td>
<td>2.0 cr.</td>
<td>P. Guzelian, 720-482-9198. Students will perform literature research to address actual ongoing consultations made to a private practice of environmental toxicology. Questions of occupational or environmental safety, product safety, regulatory compliance, personal injury and medical monitoring will be addressed by writing conclusions formed by use of principles of Evidence-based toxicology.</td>
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<tr>
<td>TXCL 7560</td>
<td>Drug Metabolism and Pharmacogenetics 1</td>
<td>2.0 cr.</td>
<td>Dr. V. Vasiliou, 303-315-6153. Crosslisted: PHCL 7560. This course will focus on the reactions that the exogenous compounds undergo in mammalian systems and the mechanisms of these reactions. Enzyme kinetics and unusual (idiosyncratic) drug responses that have a hereditary basis will be discussed. The interrelationship between genes and drug metabolism along with studies on polymorphic differences in genes encoding drug-metabolizing enzymes will also be discussed.</td>
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<tr>
<td>TXCL 7561</td>
<td>Drug Metabolism &amp; Pharmacogenetics 2</td>
<td>2.0 cr.</td>
<td>Dr. D. Petersen, 303-315-6159. Crosslisted: PHCL 7561. This interdisciplinary course is designed to provide the student with current information on the basic concepts of xenobiotic and drug metabolism pathways. Major emphasis is placed on the relationship of inter-individual differences in the metabolism of therapeutic agents to pharmacologic response and toxicity.</td>
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<tr>
<td>TXCL 7562</td>
<td>Analytical Basis of Forensic Toxicology</td>
<td>2.0 cr.</td>
<td>Dr. J. Ruth, 303-315-7569. Prereq: Organic chemistry with lab. Principles of analysis of abused drugs in biological samples within the framework of legal requirements. Considerations include type of sample, routes and kinetics of metabolism, analytical methodology and possible inferences of physiological impairment. Agents include ethanol, cocaine, cannabinoids, amphetamines, opiates, phencyclidine and anabolic steroids.</td>
</tr>
<tr>
<td>TXCL 7564</td>
<td>Environmental Risk Assessment &amp; Applied Toxicology</td>
<td>2.0 cr.</td>
<td>Dr. D. Pyatt, 303-315-0565. Provides students with experience in risk assessment and environmental toxicology for public health and regulatory decision making. Topics include comprehensive human health risk assessments, both baseline and probabilistic statistics, ecological risk assessment activities associated with emergency action, medical monitoring and the role toxicology plays in the courtroom.</td>
</tr>
<tr>
<td>TXCL 7650</td>
<td>Research Rotation in Toxicology</td>
<td>Variable cr.</td>
<td>Faculty - 303-315-6153. Research work in toxicology.</td>
</tr>
<tr>
<td>TXCL 7655</td>
<td>Pharmacokinetics and Toxicokinetics</td>
<td>2.0 cr.</td>
<td>Dr. D. Gustafson, 303-315-0755. This is a course on the pharmacokinetic analysis of xenobiotics. Absorption, distribution, metabolism and elimination of drugs will be discussed with focus on mathematical descriptions.</td>
</tr>
<tr>
<td>TXCL 7670</td>
<td>Methods in Molecular Toxicology</td>
<td>2.0 cr.</td>
<td>Dr. C. Franklin, 303-315-2447. This is a laboratory-based course that involves the carrying out of biochemical, molecular and analytical based experiments in the laboratories of toxicology faculty. Requirements for each laboratory assignment will be at the discretion of the instructor for that section.</td>
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