

**Neuroscience (NRSC) Program Coursework**

updated: 10/2009

**A. Required courses** : Every student must carry at least **12 units** of graduate course work in each fall and spring semester in order to remain in good standing in the NRSC Program.

**Required courses:** (Table 1) Core curriculum courses are NRSC 502, 588, two semesters of NRSC 695f, and a choice of NRSC 506 OR 564 OR 589, totaling 13 units. Additional courses are needed in Statistics, and in Communications & Ethics (5-6 units).

**Research rotations (NRSC 700):** Two semesters of laboratory rotations are done in the laboratories of at least two Neuroscience program faculty. *One unit of credit represents three hours of work per week (48 hours/semester per unit).* A total of 4-6 units is recommended (as full semesters, half semesters, or a combination).

**TABLE 1: CORE COURSEWORK.** (\*) indicates required core courses; (#) indicates core courses of which ONE must be selected. Students must achieve a grade of B or better in each of the courses taken in the core curricula; failure to achieve a grade of B or better will result in dismissal from the Program and conversion to non-degree status.

Semester	Course	units	Faculty coordinator
<i>fall core</i>	*NRSC 588 Cell Molec Neurobiology	4	Zinsmaier
	NRSC 700 Research rotation	2-4	NRSC faculty
	# NRSC 506 Neural Encoding, Memory & Computation in the Mammalian Brain	3	TBA
	*NRSC 695f Neurosci. Colloquium	2	Zinsmaier
	(NRSC elective or minor course to reach total $\geq 12$ units per semester)	varies	faculty
<i>spring core</i>	# NRSC 589 Systems Neurobiology	3	Gronenberg
	# NRSC 564 Neurophysiology: Sensorimotor Perspective	3	Fuglevand
	*NRSC 502 Principles of Neuroanatomy	4	Ryan
	NRSC 597H Neuroanatomy Lab (optional)	1	
	*NRSC 695f Neurosci. Colloquium	2	Zinsmaier
	NRSC 700 Research rotation	2-3	NRSC faculty
(NRSC elective or minor course to reach total $\geq 12$ units per semester)	varies	faculty	
<i>Ethics</i>	NRSC 701 Commun in Neurosci (or equivalent)	2	TBA ( <i>check availability</i> ) Burd ( <i>spring</i> )
	-and- NRSC 695e Science, Society & Ethics	1	
	-OR- PHCL 595B – Scientific Writing Strategies, Skills & Ethics	2	Stamer ( <i>fall</i> )
-OR-	PSIO 649 – Survival Skills and Ethics	3	Hoit ( <i>spring</i> )
<i>Statistics</i>	See list on pg 2 for suggested options	3-4	-----

**Registration information:** Schedule of classes-- <http://garnet.ccit.arizona.edu/schedule.cgi>  
 On-line course registration-- [https://sl5.ccit.arizona.edu/student\\_link/login.asp](https://sl5.ccit.arizona.edu/student_link/login.asp)  
 (Needed: 9-character Student ID # and 4-digit Personal Identification Number (PIN))

In the second year, students typically complete their coursework for the elective and minor courses, carry 1-8 units of research (NRSC 900, before the comprehensive exams), and 1-6 units of independent study (NRSC 599/699) if desired. In subsequent years, students take 1-9 units of dissertation research (NRSC 920, after passing the comprehensive exams) and supplemental registration (NRSC 930) to meet the 12-unit minimum enrollment requirement.

**NRSC Students are expected to maintain an overall grade-point average of at least 3.00 (B) and to have no more than a total of 2 grades of C; failure to achieve such a record can result in conversion to non-degree status and dismissal from the Program at any time.**

*Summary of units for typical NRSC program:*

13 units	Core courses (NRSC 502, 588, 695f, and [506 or 564 or 589])
5-6	Statistics and Communication/Ethics courses
2	Neurosci Colloquium
4-6	Research rotations (NRSC 700)
3-6	Neuroscience elective courses (see table 2)
9	Minor courses
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≥ 36 units	(at least half of these must be taken for a grade)
Additional courses totaling ~36 units:	
NRSC 900	Research
920	Dissertation
NRSC 930	Supplemental registration
NRSC 599/699	Independent study
TOTAL needed= 72 units for graduation	

The combination of required, elective and minor courses must total a minimum of 36 units of graduate work; at least half of these units must taken for letter grades. The Graduate College requires at least 72 units of graduate work, including research (NRSC 900) and dissertation (NRSC 920) units.

**STATISTICS COURSE REQUIREMENT.** At least two units of statistics are required. Students may choose from the list below, or request the NRSC Graduate Advisory Committee to have an equivalent course considered for meeting the requirement.

Courses in statistics		units and semester offered
EPID 576A	Biostatistics for Public Health	3 units, fall and spring
EPID 576B	Biostatistics for Research	3 units, spring
PSYC 507A *	Research Design & Analysis of Variance	3 units fall and spring
PSYC 507B *	Statistical Methods in Psychological Research	3 units, spring
PSYC 507C *	Research Design & Analysis of Variance	3 units, spring
ENTO 613/ RNR 613	Applied Biostatistics	4 units, spring
other stats course	by approval of the NRSC Program Graduate Advisor	3-4 units

\* request instructor approval for enrollment

**Timeline (general overview of recommended plan):**

<b>Year 1:</b>	Complete research rotations, most of core curriculum, some elective and minor courses.
	End of year 1--      choose mentor
	with mentor, choose committee members
	schedule first committee meeting
<b>Year 2:</b>	Complete core curriculum, minor and elective courses Meet with committee to plan examinations.
	End of year 2--      written examination
	spring/summer --      oral examination
	before fall of year 3--      “Advanced to Candidacy” (passed both exams)
<b>Years 3-5:</b>	Dissertation research; meet regularly with committee
	Third year--      dissertation proposal
	Subsequent years--      complete dissertation work
	Write dissertation and defend no later than end of 5 <sup>th</sup> year

**B. Neuroscience elective courses:** Choices from Table 2 should total 3-6 units as needed to reach a total of 36 units (not including dissertation research and independent study). At least half of the 36 units must be taken for a letter grade (not pass/fail).

**TABLE 2.** Coursework for the Neuroscience electives can be taken from any themes. *Specific courses selected to fulfill the core requirements cannot also be counted as electives.*

Additional courses of interest to individual students can be accepted after confirmation with the student's Advisory Committee or the Graduate Advisor. The U of A Graduate College now discourages cross-listing of classes, hence some of the courses listed in the table below do not carry the 'NRSC' prefix. Irrespective of the prefix, all these courses will be accepted as Neuroscience electives. Some courses are listed twice as they may cover more than one 'theme' (e.g. Systems and Computational Neuroscience).

**NRSC elective courses (as of April 2009)**

theme		course #	title	units	instructor
cell/molec	fall	PHCL 620	Principles of Pharmacology	3	Sloviter
cell/molec	fall	PSIO 503	Cellular & Molecular Physiol	5	Simon
cell/molec	fall	GENE533	Human Genetics	3	Brilliant
cell/molec	fall	GENE539	Methods Cell Biol. & Genomics	3	Galbraith/Pala
cell/molec	spring	CBA 577	Principles of Cell Biology	4	Gordon
cell/molec	fall/ spring	NRSC695D	Human Genetic Disease Colloq.	3	Restifo

developm.		CBA556	Developmental Biology	3	Antin
Systems	spring	NRSC589	Systems Neurobiology	3	Gronenberg
Systems	spring	NRSC564	Neurophysiology: Sensorimotor Perspective	3	Fuglevand
Systems		PSIO595M	Assgnm. in Motor Control	1	Rankin
Systems	fall	PSYC 504	Human Brain-Behavior Relationships	3	Ryan
Systems		PSIO 620	Introduction to Systems Neurophysiology	2	Levine
Systems	fall	PSIO595G	Muscle Biology	2	Rankin
Systems	spring	PSIO 603	Human Physiology	8	Lynch, Gothard, Fregosi et al.
Behavior	fall/ spring	NRSC 596E*	Biopsychology	3	Figueredo Gothard
Behavior	fall	ECOL587R	Animal Behavior	3	Papaj
Behavior	fall	ECOL587L	Animal Behavior Lab	1	Papaj
Behavior		Ecol596V	Topics in Behavior and Cognition	3	Dornhaus
Behavior.	spring	ECE/BME/N RSC 525	Reverse-Engineering the Fly: From Physiology to Computational Models	3	Higgins
Behavior	spring	Chem 536	Science & Ethics of modifying human behavior	3	Hruby
Medical	fall	PSYC 524	Gerontology: A Multidisciplinary Perspective	3	Barnes
Medical	spring	NRSC502	Principles of Neuroanatomy	4	Ryan
Medical	spring	NRSC 597H	Neuroanatomy Lab	1	Ryan
Medical	fall/ spring	NRSC 695D	Human Genetic Disease Colloq.	3	Restifo
Medical	fall	PSIO595G	Muscle Biology	2	Rankin
Cognitive	fall spring	PSYC 501a	Princip. Psychophysiology	3	Allen
Cognitive	fall/ spring	PSYC 501b	Psychophysiology Laboratory	3	Allen
Cognitive		PSYC520	Cognit. Neurosci. of Hearing	3	Lotto
Computat.	spring	PSYC596L	Intro. Neural Data Analysis	3	Fellous
Computat.	fall	PSYC503C	Introd. Computational Neurosci.	3	Fellous
Computat.	spring	ECE/BME/N RSC 525	Reverse-Engineering the Fly: From Physiology to Computat. Models	3	Higgins
Computat.	fall	PSIO572	Quant. Modeling of Biol. Systems	3	Secomb/Bergevin
General	fall spring	CBA579	Art of Scientific Discovery	3	Gordon
General	fall	CBA565A	Fundamentals of Light Microsc. and Electronic Imaging	3	Elliot

Students and faculty are welcome to consult with the Graduate Student Advisor to determine whether neuroscience-related courses that are not listed might be acceptable as electives.

**C. Minor coursework for Neuroscience students: At least 9 units of classes.**

Predoctoral students can pursue a minor in any established department or program, as determined by the guidelines of the minor program. Alternatively, the student may choose the “Distributed Minor in Neuroscience” option that offers a flexible curriculum tailored to the student’s interests.

*The minor should be selected in consultation with the dissertation advisor and must be approved by the NRSC Graduate Advisory Committee.* Contact Erin Wolfe for a Statement of Minor form to submit for review and approval.

Examples of established programs for consideration include: Cell Biology & Anatomy, Biochemistry, Cognitive Science, Entomology, Genetics, Molecular & Cellular Biology, Medical Pharmacology, Physiological Sciences, Psychology, Speech & Hearing Sciences, and others.

**D. Minor in Neuroscience for graduate students in other programs: At least 9 units of classes**

The minor in Neuroscience requires passing one of the following of the core course options (3-4 units):

NRSC 506, 564, 588 OR 589

and 5-6 additional units in courses that are offered by or cross-listed in NRSC. The NRSC Colloquium course NRSC 695f is valid for the minor.

Contact Erin Wolfe for a Neuroscience Minor application form: [erin@arizona.edu](mailto:erin@arizona.edu), or visit the Neuroscience website at [www.neuroscience.arizona.edu/students/minor.html](http://www.neuroscience.arizona.edu/students/minor.html)

**Course descriptions:****NRSC 588 -- Principles of Cellular and Molecular Neurobiology (3 units)**

Description: Detailed introduction to the biology of nerve cells, emphasizing cellular neurophysiology, synaptic mechanisms, and analysis of neural development.

Prerequisite(s): consult program office before enrolling.

Identical to: CBA 588, MCB 588, BIOC 588, INSC 588, PSIO 588. Usually offered: Fall.

**NRSC 506 -- Neural Encoding: Memory and Comprehension of Mammals (3 units)**

Description: Theoretical principles and biological mechanisms by which information is represented, categorized, stored, and recalled in specific central nervous system (CNS) circuits in the course of adaptive behavior. Graduate-level requirements include an in-depth research paper on a single aspect of neural encoding.

Prerequisite(s): PSYC 507B.

Identical to: PSYC 506; PSYC is home department. Usually offered: Fall

**NRSC 589 -- Principles of Systems Neurobiology (3 units)**

Description: Detailed introduction to the organization, physiology, and function of neural systems, emphasizing sensory systems, motor control, integration, and plasticity.

Prerequisite(s): NRSC 588; consult program office before enrolling.

Identical to: CBA 589, INSC 589, PSIO 589. Usually offered: Spring.

**NRSC 502 -- Principles of Neuroanatomy (4 units)**

Description: Cellular elements and recognized subsystems of the mammalian nervous system, with emphasis on general principles of neuroanatomical organization and their functional significance.

Prerequisite(s): 8 units of biological laboratory science, CBA 401; PSYC 302, PSIO 480 desirable.

Consent of instructor.

Identical to: PSYC 502; PSYC is home department. Usually offered: Spring.

**NRSC 597H--- Human Neuroanatomy (1 unit)**

Description: This course provides an overview of the gross and sectional anatomy of the human brain and is designed to complement Psychology 502, Principles of Neuroanatomy.

Prerequisite(s): or Concurrent registration, PSYC 502.

Identical to: PSYC 597H; PSYC is home department. Usually offered: Fall, Spring.

**NRSC 505 -- Basic Neurochemistry (3 units)**

Description: This course will cover the basic aspects of brain biochemistry that are peculiar to function of neurons and glia. It will begin with an overview of the basic biochemical mechanisms underlying neuronal function and then discuss their role in disease and brain function. Then it will conclude with short presentations on related topics by the enrolled students.

Prerequisite(s): Graduate students only; basic understanding of biology and chemistry.

Identical to: PSYC 505; PSYC is home department. Usually offered: Fall, Spring, Summer.

**NRSC 524 -- Gerontology: A Multidisciplinary Perspective (3 units)**

Description: Biological, psychological, and social issues in aging, including brain changes with age, cognitive change with age, and the social impact of increasingly older population demographics.

Graduate-level requirements include an in-depth research paper on a single aspect of gerontology.

Identical to: PSYC 524; PSYC is home department. Usually offered: Fall.

**NRSC 530 -- Neural Basis of Language (3 units)**

Description: The neural basis of language comprehension and production, with reference to its relationship to other perceptual, cognitive and motor skills.

Prerequisite(s): graduate status.

Identical to: PSYC 530; PSYC is home department. Usually offered: Fall.

**NRSC 564 -- Neurophysiology: Sensorimotor Perspective (3 units)**

Description: Focuses on mammalian sensorimotor system as a model system to understand principles of

neural communication, sensory functions, information processing, and production of behavioral responses. Graduate-level requirements include a research paper.

Identical to: PSIO 564; PSIO is home department.

May be convened with: NRSC 464. Usually offered: Spring.

#### NRSC 581 -- Neural Mechanisms of Behavior (2 units)

Description: Focuses on arthropods as model systems for understanding the control of behavior by the nervous system. Introduces sense organs and sensory processing, control of movement by motor neurons and central motor circuits, and integrative mechanisms and neuronal plasticity that give rise to complex behavior such as learning and memory.

Prerequisite(s): NRSC 282 Usually offered: Fall.

#### NRSC 582 -- Topics in Neural Development (2 units)

Description: An in-depth analysis of the cellular and molecular basis of neural development. Students will read and discuss journal articles dealing with the development of neurons and their synaptic connections.

Prerequisite(s): consult program office before enrolling.

Identical to: CBA 582, MCB 582, PSIO 582. Usually offered: Fall.

#### NRSC 594 -- Practicum (1-6 units)

Description: The practical application, on an individual basis, of previously studied theory and the collection of data for future theoretical interpretation.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring.

#### NRSC 599 -- Independent Study (1-6 units)

Description: Qualified students working on an individual basis with professors who have agreed to supervise such work. Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

#### NRSC 653 -- Neuropharmacology/Drugs of Abuse (3 units)

Description: Role of various neurochemicals in the peripheral and central nervous systems and the effects of drugs on the nervous system, including their actions at receptors and their influence on synthesis, storage, and release of neurotransmitters.

Identical to: PCOL 653; PCOL is home department. Usually offered: Spring.

#### NRSC 695A -- Motor Control (2 units)

Description: contact department.

May be repeated: for credit 3 times (maximum 4 enrollments).

Identical to: PSIO 695A; PSIO is home department. Usually offered: Spring.

#### NRSC 695f/g -- Neuroscience Colloquium (2 units/1 unit)

Description: Development and exchange of scholarly information through discussion of published and on-going research. Topics of the colloquium will have novel, significant, controversial, and/or far-reaching implications that are of general interest and cover the breadth of neuroscience including molecular, cellular, systems and cognitive neuroscience.

Grading: Regular or alternative grades can be awarded for this course: A B C D E or S P C D E.

Usually offered: Fall, Spring. course director: K. Zinsmaier

#### NRSC 695D -- Human Genetic Disease Colloquium (3 units)

Description: The course will cover a few medical genetic disorders in depth, with different topics each year. Clinical presentation, pathophysiology, genetic mechanisms and biochemical features will be considered. Readings will come mainly from the primary biomedical literature.

Grading: Regular or alternative grades can be awarded for this course: A B C D E or S P C D E.

May be repeated: for credit 3 times (maximum 4 enrollments).

Identical to: CBA 695D; CBA is home department.

Usually offered: Fall.

**NRSC 695E -- Science, Society, and Ethics (1 unit)**

Description: contact department.

Identical to: MCB 695E; MCB is home department. Usually offered: Spring.

**NRSC 699 -- Independent Study (1-6 units)**

Description: Qualified students working on an individual basis with professors who have agreed to supervise such work. Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

**NRSC 700 -- Methods in Neuroscience (1-4 units)**

Description: Research rotations in the laboratories of faculty members within the neuroscience program.

Prerequisite(s): consult neuroscience program office before enrolling.

May be repeated: for a total of 12 units of credit. Usually offered: Fall, Spring, Summer.

**NRSC 701 -- Communication in Neuroscience (2 units)**

Description: Preparation of an essay, and instruction in scientific writing.

Prerequisite(s): contact neuroscience program office before enrolling. Open to majors only.

Usually offered: Spring, if course is available

**NRSC 900 -- Research (1-8 units)**

Description: Individual research, not related to thesis or dissertation preparation, by graduate students.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

**NRSC 910 -- Thesis (1-8 units)**

Description: Research for the master's thesis (whether library research, laboratory or field observation or research, artistic creation, or thesis writing). Maximum total credit permitted varies with the major department.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

**NRSC 920 -- Dissertation (1-9 units)**

Description: Research for the doctoral dissertation (whether library research, laboratory or field observation or research, artistic creation, or dissertation writing).

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

**NRSC 930 -- Supplementary Registration (1-9 units)**

Description: For students who have completed all course requirements for their advanced degree programs. May be used concurrently with other enrollments to bring to total number of units to the required minimum.

May be repeated: an unlimited number of times, consult your department for details and possible restrictions. Usually offered: Fall, Spring, Summer.

**C SG 696i (PSYC 696i)-- Computational Intelligence (3 units)**

Temporary course: offered during Spring 2005 only.

Description: This graduate seminar course will address a variety of topics in computational approaches to the creation of "intelligent" systems. The four instructors are all active researchers in this area and, with the assistance of a number of guest lecturers, will present their differing views and approaches. This highly interdisciplinary course is designed to encourage discussion.

offered: Spring. Instructors: Barnard/ Higgins

**ENTO 613 -- Applied Biostatistics (4 units)**

Description: Introductory and advanced statistical methods and their applications in ecology. Focuses on how research design dictates choice of statistical models; explores principles and pitfalls of hypothesis

testing.

Grading: Regular grades are awarded for this course: A B C D E.

Typical structure: 3 hours lecture, 3 hours laboratory.

Identical to: RNR 613; RNR is home department. Usually offered: Spring

#### EPID 576A -- Biostatistics in Public Health (3 units)

Description: This course introduces biostatistical methods and applications, and will cover descriptive statistics, probability theory, and a wide variety of inferential statistical techniques that can be used to make practical conclusions about empirical data. Students will also be learning to use a statistical software package (STATA).

Grading: Regular grades are awarded for this course: A B C D E.

Prerequisite(s): one year of college-level mathematics.

Identical to: CPH 576A. Usually offered: Fall, Spring.

#### EPID 576B -- Biostatistics for Research (3 units)

Description: Descriptive statistics and statistical inference relevant to biomedical research, including data analysis, regression and correlation analysis, analysis of variance, survival analysis, biological assay, statistical methods for epidemiology and statistical evaluation of clinical literature.

Grading: Regular grades are awarded for this course: A B C D E.

Prerequisite(s): EPID 576A, EPID 573A.

Identical to: CPH 576B. Usually offered: Spring.

#### PHCL 595B -- Scientific Writing Strategies, Skills and Ethics (2 units)

Description: Provide students with skills to write/communicate effectively for a variety of scientific audiences; including scientific journals, funding institutions, potential employers as well as administration in academia and industry. Identical to: BME 595B, CBIO 595B, PS 595B, PCOL 595B.

Usually offered: Fall. Instructor: W. Daniel Stamer

#### PSIO 503 -- Cellular and Molecular Physiology (5 units)

Description: Through examination of fundamental cellular processes, the integrated function of diverse cell types is discussed. Topics include: mechanisms involved in protein expression, intracellular protein targeting, and regulation of protein function; membrane transport phenomena; cell signaling mechanisms-excitability, ion channels, synaptic function; muscle and vascular function.

Prerequisite(s): CHEM 103B, CHEM 104B, CHEM 241B, CHEM 243B, PHYS 103, MATH 125, MATH 129, BIOC 460. Identical to: PS 503. Usually offered: Fall.

#### PSIO 530 -- Physiological Basis of Psychoneuroimmunology (3 units)

Description: Function of the immune system and how this is modulated by the nervous and hormonal systems; effects of genetics and stress on psychoneuroimmunology. Graduate-level requirements include a paper (min. 10 pages and 5 scientific sources) reviewing an approved topic of their choice in the field of psychoneuroimmunology.

May be convened with: PSIO 430. Usually offered: Fall. Instructor: Ann Baldwin

#### PSIO 649 -- Survival Skills and Ethics (3 units)

Description: This course is designed for graduate students and postdoctoral fellows. It provides information and experiences that will aid in successful "survival" during the graduate-student years and those following graduation. Topics include effective speaking and writing, grantspersonship, mentoring, teaching, career options, among others. Discussion of ethical issues and resources is integrated across topics. Grading: Regular grades are awarded for this course: A B C D E.

Identical to: SP H 649; SP H is home department.

Usually offered: Spring. Instructor: Jenny Hoit

#### PSYC 503C -- Introduction to Computational Neuroscience (3 units)

Description: This course covers the basic simulation techniques for biophysical modeling. Topics include: single and multi compartmental models, intrinsic neuron properties and dendritic integration and large networks of biophysical neurons with realistic stochastic synaptic transmission. Graduate-level requirements include a term project, including hands on simulation and research-level literature searches. Projects will include the analyses of real data.

Grading: Regular grades are awarded for this course: A B C D E.

Identical to: INSC 503C.

May be convened with: PSYC 403C.

Usually offered: Fall, Spring.

PSYC 512 -- Animal Learning (3 units)

Description: Animal learning with emphasis on interspecies comparisons. Graduate-level requirements include an in-depth research paper on an aspect of animal learning.

May be convened with: PSYC 412.

Usually offered: Spring. Instructor: James King

PSYC 596L -- Introduction to Neural Data Analyses (3 units)

Description: This course will cover the basic methods available for the analyses of single unit and multi units spike data. Several measures of neural activity will be discussed, and illustrated on the basis of actual and simulated neural data. Knowledge of Matlab is required, knowledge of basic neurobiology is recommended. Graduate-level requirements include an additional paper.

Grading: Regular or alternative grades can be awarded for this course: A B C D E or S P C D E.

May be convened with: PSYC 496L.

Usually offered: starting in Spring 2007. Instructor: Jean-Marc Fellous

PSYC 507A -- Statistical Methods in Psychological Research (3 units)

Description: Statistical research design, methods and metascience. Variants and extensions of the general linear model including bivariate and multiple regression, analysis of variance and covariance, planned orthogonal contrasts and multiple comparisons, simultaneous and sequential canonical correlation analysis, discriminant function analysis and multivariate analysis of variance.

Grading: Regular grades are awarded for this course: A B C D E. Usually offered: Fall.

PSYC 507B -- Statistical Methods in Psychological Research (3 units)

Description: Statistical research design, methods and metascience. Application of the structural equations modeling to manifest variable (path analysis) and latent variable (multivariate) causal analysis, confirmatory and exploratory factor analysis, and hierarchical (variance component) linear models, including generalizability theory, meta-analytic, and growth curve parameter models.

Grading: Regular grades are awarded for this course: A B C D E.

Prerequisite(s): PSYC 507A. Usually offered: Spring.

PSYC 507C -- Research Design & Analysis of Variance (3 units)

Description: This course provides an overview of research design and statistical analysis with a special focus on Analysis of Variance. Various designs including between subjects, repeated measures, mixed, hierarchical and Latin Square designs are covered. Other topics addressed are contrasts among means and trends analysis.

Grading: Regular grades are awarded for this course: A B C D E.

Prerequisite(s): PSYC 507A. Usually offered: Fall, Spring.

CBA 577 -- Principles of Cell Biology (4 units)

Description: Intensive, graduate-level introduction to principles and mechanisms of cell biology, including current research strategies in the field.

Grading: Regular grades are awarded for this course: A B C D E.

Prerequisite(s): consent of course coordinator.

Identical to: MCB 577.

Usually offered: Spring.