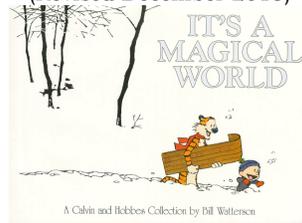


# Psychology 515

## Neuromechanisms/Biological Bases of Behavior

(Revised December 2013)



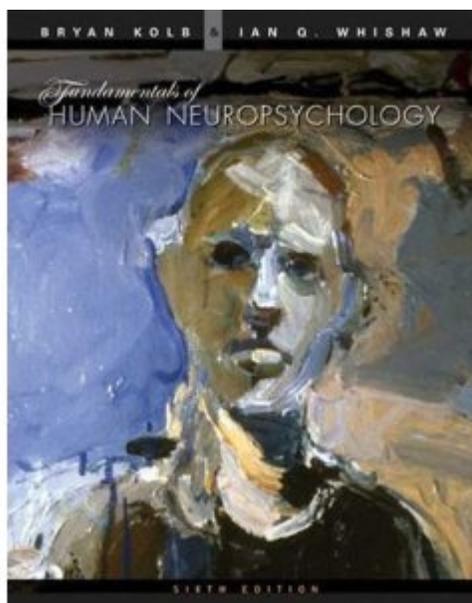
 *Note: This syllabus is subject to small changes once the semester begins. These will include corrections and slight refinements in the assignment(s).*

### **Description of Course from Graduate Catalogue:**

515. Neuromechanisms/Biological Bases of Behavior. Three semester hours.

Designed for psychology or counseling students, this course is concerned with biological bases of developmental neuropsychiatric, peripheral nervous systems, psychophysiology, behavioral pharmacology, and their relations to central nervous system arousal, motivational, emotional, and memory structures. Prerequisites Psy 315 or consent of instructor. *(I swear I did not write this. I don't even know what the two adjectives "developmental" and "neuropsychiatric" stuck together mean – they have no noun to modify.)*

*(In the matter of the prerequisite, it will be good if you have had an A&P or similar course before entertaining this one. If I let you in without a smattering of adequate preparation, you will enter the class at somewhat greater risk than many of the others. Caveat emptor, as they say. But I will let you in – we live in a marketing world.)*



**Textbook:**

Kolb, B., & Whisaw, I. Q. (2009). *Fundamentals of human neuropsychology*, (6<sup>th</sup> ed.). New York: Worth.

The university bookstore sells this book new for \$193.10 (an increase in a year of \$43.10), and used for \$154.50. Amazon sells the book new for \$132.83 (an increase in a year of \$29.93) + a fair shipping charge. It's your call.



You will need access to this book to write your paper:

American Psychological Association. (2009). *Publication manual* (6th ed., second printing or later). Washington, DC: Author.

Amazon sells this book new for \$27.45, and a Kindle edition for \$23.00. The university bookstore sells it new for \$33.30 and used for \$26.65. It's your call.

### **Web Enhancement:**

We will manage this course in part using online “web enhancement.” This fact has a number of implications for your conduct and success:

1. As soon as available you should go to the online web site for this course, complete the tutorial (if you like), and familiarize yourself with what is there (which will be added to as the semester progresses). You may access eCollege by going to your My Leo account and clicking on eCollege.
2. You will turn in written assignments in assigned “dropboxes,” not in hard copy or by ordinary email attachment
3. Use this formula to name the files you turn in this way: YOURLASTNAME.YOURFIRSTNAME.AssignmentName.Date. If I were going to turn in a “paper on weed” assignment on May 11, 2014, the file name would be BALL.STEVE.WeedPaper.5-11-14. Check the Dropbox Protocol link on eCollege for more details. Right now you will need to turn in only one project this way, which you will also need to upload to doc sharing, so all the other students can have a copy of your product.
4. You will receive written feedback for most (if not all) of your written assignments by way of eCollege.
5. You will take exams online, and we will take *no* class time (including the scheduled final examination period) for test taking. The scheduled final examination period is reserved for additional lecture time as needed.
6. You will retrieve documents to read from me by way of the Doc Sharing tab, and web sites to read on the “Webliography” tab. Some of the latter *may* be accessible by way of links placed strategically within each week’s overview and assignments, but don’t count on it.
7. You will need to check the Announcements section on the course home page daily.
8. You will need to check your university e-mail (\_\_\_\_@leo.tamu.edu) daily.
9. Do not send me an e-mail about this class except through eCollege. I will not respond to other e-mails about this class.
10. If you have a question of general concern to the class (not just a possibly personal or private concern of your own), go to the virtual office and ask it there. That way

everybody has access to the answer and I don't have to respond to it more than once. I will ignore your e-mails if you are ignoring this requirement.

**Our Contractual Agreement:**

Through the university I am offering this course to you (and a grade in it) in exchange for your doing the work specified in this syllabus, and otherwise complying with university regulations and requirements. If you choose to continue your enrollment in the course (whether you attend or not, and whether you read this sentence or not), I will assume that this agreement is consummated. You and I will thus be responsible for the content of this syllabus and complying with its specifics. Each of us is further acknowledging that we will abide by and accept the outcomes generated in this course through the appropriate application of the guidelines of its syllabus.

**General Objectives of the Course:**

Students taking this course, most of whom are aiming for careers in the "helping professions," will be able to do the following at the end of this course:

1. Visualize and describe the "internal topography" of the body, especially the nervous, endocrine, muscular, circulatory, respiratory, reproductive, and digestive systems, describing the general functions and principal interactions of these units as well.
2. Describe the "behavioral geography" of the human brain, especially as it relates to neuropathology derived from trauma, cerebrovascular accident, neoplastic processes, bacterial and viral infection, immune system dysfunction, chemical toxicity, and degenerative processes.
3. Describe the principal pathways connecting structures in the human brain that are germane to normal and abnormal psychological functioning, and that are affected by psychotropic drugs.
4. Describe the way in which communication among cells takes place in the body, with especial reference to neuronal functioning and synaptic transmission.
5. Describe the nature and effects of the multiple chemical cascades that follow synaptic and volume transmission in both the presynaptic and postsynaptic neuron.
6. Describe the principal mechanisms by which psychotropic drugs affect nervous system functioning, articulating the general views of how each of the major classes of psychotropic agents affects the synapse and other neuromechanisms.
7. Describe the general physiological explanations associated with emotion, motivation, learning and memory, arousal, personality, and psychopathology, showing also the way in which neural damage produces variations in these systems.
8. Describe a basic approach and conceptual strategy to carry out neuropsychological assessment of possible neuropathology and its effects on behavior.
9. Time permitting: Administer and interpret the Halstead-Reitan Neuropsychological Assessment Battery, the Wechsler Memory Scales, Wide Range Assessment of Memory and Learning (WRAML), the NEPSY-II, and other neuropsychological assessment devices.

**Topical Outline:**

Note: Chapters from Kolb and Whishaw will be obviously linked to the topical outline below, but I will make specific assignments as we go along. I expect you to read ahead of where we are in class as we will spend a while working on the fundamentals, moving quite quickly toward the end. Forewarned . . . as they say.

We will cover **TRACK 1** and **TRACK 2** in parallel, and more or less simultaneously. In the first part of the period we will cover gross and detailed anatomy with occasional broad reference to relevant neural connections and transmission. In the second part of the period we will cover the “chemically addressed nervous system” and psychopharmacology.

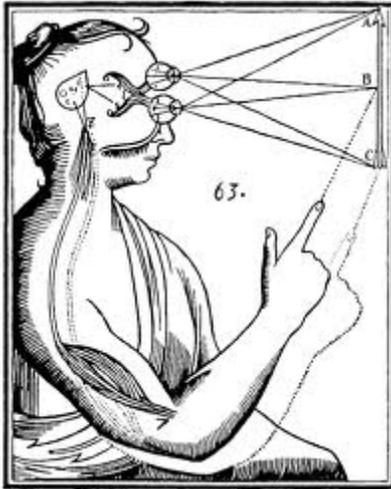
*Note: This is an idealized plan. Reality and the necessity of slowing down on some material makes it simply a fond hope. We will do what we can though.*



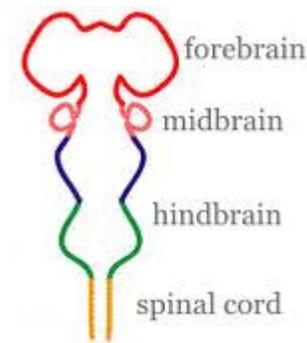
## TRACK 1



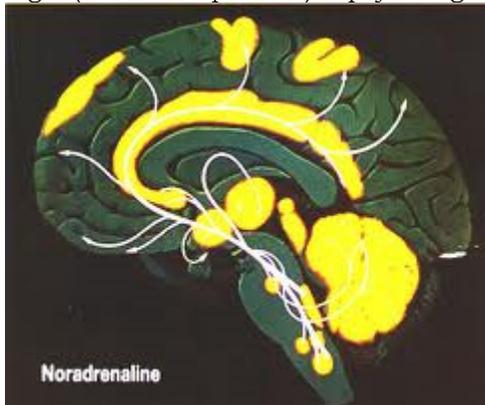
### I. Philosophy, biology, and psyche



- A. The historical move toward biopsychology
    1. Metaphysical dualism
    2. Impact of the Renaissance
    3. Materialism
    4. The CNS (Conceptual Nervous System)
  - B. Reductionism
    1. The nature of science
    2. Reductionism as an escape from the full obligation of the scientist
    3. Thick and thin construct making
- II. The structure of the nervous system: An overview

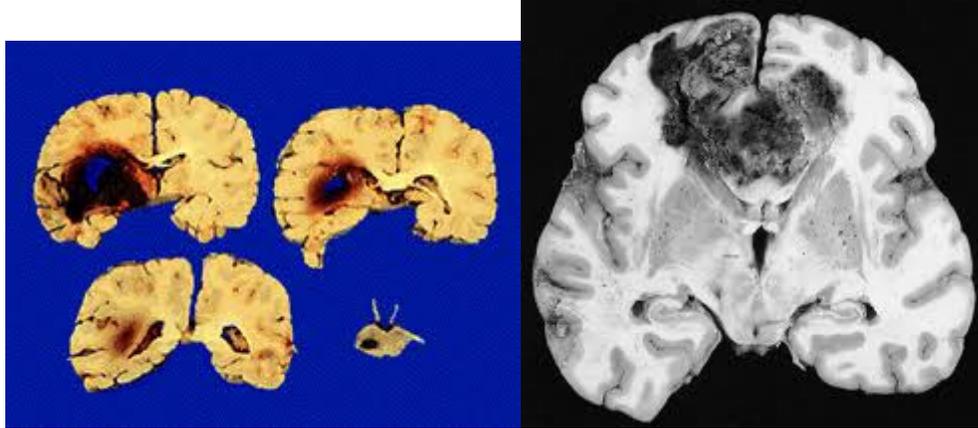


- A. The generalized vertebrate brain
  1. Endoderm, mesoderm, and ectoderm
  2. The embryonic vertebrate brain
  3. Basic plan of the vertebrate brain
  4. Distinguishing the human brain
  5. Appearance of neopallium
- B. Preliminary details of some functional systems
  1. The peripheral nervous system
    - a. Spinal and cranial nerves
    - b. Components of the peripheral nerves
      - i. Afferent and efferent components
      - ii. General and special components
      - iii. Autonomic nervous system
  2. The ascending (sensory) pathways
    - a. The [medial] lemniscal system
    - b. The special senses
    - c. The thalamus and sensory cortex
  3. The descending (motor) pathways
    - a. The pyramidal system
    - b. The extrapyramidal system
    - c. Basal ganglia and motor cortex
- C. Principal linkages (circuit components) of psychological importance



1. Major dopamine projections
2. Major norepinephrine projections
3. Major serotonin projections
4. Major acetylcholine projections
5. Histaminic projections from the tuberomammillary nucleus of the hypothalamus
6. Cortico-striatal-thalamic-cortical loops
  - a. EF: DLPFC–upper caudate–thalamus–DLPC
  - b. Attention: Dorsal ACC–interior striatum–thalamus–dorsal ACC
  - c. Emotional modulation: Subgenual ACC–nucleus accumbens–thalamus–subgenual ACC
  - d. Impulsivity/compulsivity: Orbito-frontal cortex–inferior caudate–thalamus–orbito-frontal cortex
  - e. Motor control: Prefrontal motor cortex–putamen–thalamus–prefrontal motor cortex

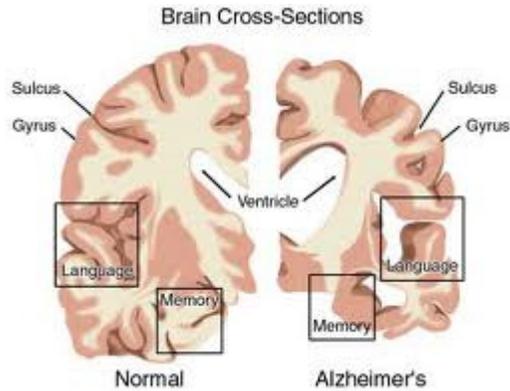
- D. Behavioral geography of the forebrain I: Normal functioning
  - 1. The left-right dimension
  - 2. Parieto-occipito-temporal cortex
  - 3. Temporal lobes
  - 4. Frontal lobes
- E. Behavioral geography of the forebrain II: Neuropathology [15,16]



- 1. Head trauma
- 2. Vascular disorders and CVAs
- 3. Neoplastic processes
- 4. Bacterial and viral infection
- 5. Immune system dysfunction including MS and HIV
- 6. Chemical toxicity
- 7. Special circumstances



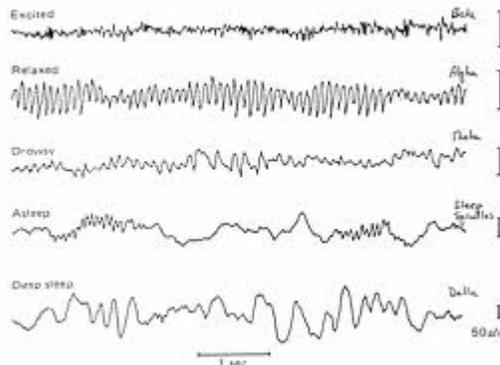
- a. Anomalous embryonic and fetal development
- b. Maternal nutrition and chemical toxicity
- c. Anoxia and hypoxia
- d. Attention deficit hyperactivity disorder
- e. Pervasive developmental disorders
- f. Schizophrenia
- g. Degenerative processes including Alzheimer's disease



- III. Neuropsychological assessment
  - A. A rationale for neuropsychological assessment
  - B. Kinds of neuropsychological tasks
    - 1. Levels of performance
    - 2. Pathognomonic signs
    - 3. Right-left differences
  - C. Building a battery

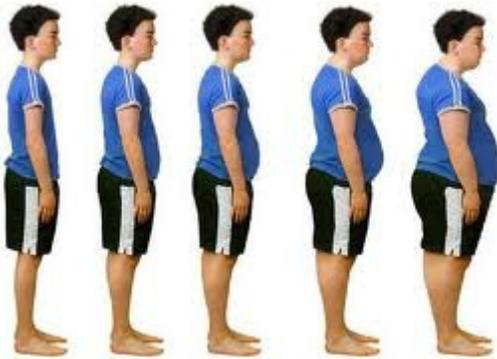


- 1. The Halstead-Reitan neuropsychological assessment batteries
    - 2. Memory scales
    - 3. Linguistic and spatial measures
  - D. Using the NDS and the “dendogram”
- IV. States of consciousness



- A. The EEG
- B. Sleep
  - 1. Normal sleep
  - 2. Paradoxical sleep
  - 3. Disturbances of sleep
- C. Nonsleeping states
  - 1. Active wakefulness
  - 2. The "alpha state"
  - 3. Hypnagogic states
  - 4. Hypnosis

- 5. Meditation
- 6. Drug-induced states
- 7. Biofeedback
- V. Emotion and feelings
  - A. Classification of emotional responses
  - B. Autonomic nervous system
  - C. Peripheral psychophysiology of emotion (details of some important pattern reflexes)
    - 1. Pain
    - 2. Fear
    - 3. Anger
    - 4. Joy
    - 5. Relaxation
    - 6. Revulsion and emesis
    - 7. Sexual arousal
  - D. Theories of emotion
  - E. Central mechanisms
  - F. Biochemistry of emotion and psychopharmacological intervention
  - G. Biofeedback
- VI. Motivation
  - A. Theory of motivation
  - B. Hunger



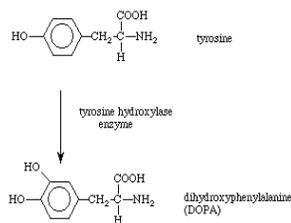
- 1. Peripheral mechanisms
- 2. Central mechanisms
- 3. Clinical factors in obesity control
- C. Sex
  - 1. Sexual response
  - 2. Peripheral factors in sexual motivation
  - 3. Central factors in sexual motivation
  - 4. Sexual dysfunction
- D. Epistemic motivation
- E. Intracranial stimulation studies
- VII. Psychopathology and behavioral medicine
  - A. Seizure disorders
  - B. Stress
    - 1. Stress models
      - a. Selye and bio-behavioral models
      - b. Lazarus and cognitive models
      - c. The Ball synthesis
    - 2. Disease
      - a. Cardiovascular and vascular disorders
        - i. Coronary artery disease
        - ii. Essential hypertension
        - iii. Cerebrovascular disorders and strokes
        - iv. Vascular headache
        - v. Raynaud's disease, hair loss, and worse
      - b. Gastrointestinal
        - i. Stomach and duodenum

- ii. Intestinal
    - c. Myotonic: Muscle tension, cramping, headaches, etc.
    - d. Endocrine
    - e. CNS depression
  - C. Neuroanatomy and biochemistry of mental illness
  - D. Medical therapy
    - 1. Drugs
    - 2. Electroconvulsive therapy
    - 3. Psychosurgery
    - 4. Exercise and diet
  - E. Behavioral medicine
- VIII. Learning, memory, and cognition
  - A. Learning and memory
    - 1. Basic data and models
    - 2. Developmental considerations
    - 3. Clinical applications
  - B. Mental retardation and specific learning disabilities

## TRACK 2



- I. "Wet" physiology, the chemically addressed nervous system, and psychopharmacology
  - A. Functioning of neurons and other relevant cells
    - 1. Basic cell functions of importance to neurophysiology
    - 2. The functioning of the neuron
    - 3. Muscle cells
    - 4. Glands
    - 5. Biofeedback: Some basic principles
    - 6. Synaptic transmission: Overview



- B. Intuitive chemistry
- C. Synaptic chemistry
  - 1. Neurotransmitters, their distribution, release, and metabolic "lifestyles"
  - 2. Receptor site interactions
  - 3. Mechanisms of neutralization
- E. Therapeutic drugs and their mechanisms of action
  - 1. Preliminaries
    - a. Drug research
    - b. Therapeutic index
    - c. Pharmacodynamics
    - d. Pharmacokinetics
  - 2. Antipsychotic drugs
  - 3. Antidepressants

4. Anxiolytic drugs
5. Hypnotic-sedative drugs
6. Other therapeutic agents
- E. Other drugs, their mechanisms of action, and metabolic "lifestyles"
  1. Ethanol
  2. Nicotine and caffeine
  3. Mescaline and related compounds
  4. Psilocin and psilocybin



5. The opiates
6. Amphetamines
7. Cannabis



A FRIEND WITH WEED IS A FRIEND INDEED!

8. Anticholinergic hallucinogens
9. Other agents of note

### **Course Assignments and Requirements:**

1. Students will take two cumulative examinations online through eCollege. These exams will be based on the readings, in-class presentations and interactions, and will be in multiple choice, short-answer, or essay formats (including any combination thereof – but I *usually* have all multiple choice exams). You will take the exams outside of class time, and we will meet during the weeks that exams are scheduled (including the week the final is scheduled).
2. Students will prepare a written review of one of the following conditions, with a dual emphasis on the neural basis of the problem and appropriate *post hoc* assessments and interventions to be given by clinical or school psychologists (emphasizing your personal field of expertise):
  - a. Left hemispheric hemorrhagic stroke
  - b. Right hemispheric hemorrhagic stroke
  - c. Tumor of the right or left brain parenchyma: astrocytoma or glioblastoma

- d. Closed head injuries with diffuse damage
- e. Closed head injuries with left hemispheric damage
- f. Closed head injuries with right hemispheric damage
- g. Chronic head trauma (boxing, football, etc.)
- h. Perinatal hypoxia/anoxia
- i. Adenomas or another tumor of the hypophysis (pituitary)
- j. Meningioma
- k. Neuromas or neurinoma
- l. Brain abscess, hydrocephalus, microcephalus, or another congenital malformation of brain structure
- m. Left hemisphere CVA due to thrombus or embole involving the middle cerebral artery
- n. Right hemisphere CVA due to thrombus or embole involving the middle cerebral artery
- o. CVA involving the basilar arteries
- p. Permanent effects (real and alleged) of drugs of abuse
- q. Hemangioma, angioma, aneurysm, or another vascular malformation in the brain
- r. Dementia/Alzheimer's disease
- s. Effects of encephalitis, meningitis, hydrophobia (rabies), paresis, or AIDS
- t. Arteriosclerosis of the coronary arteries
- u. Cerebral palsy

I will assign topics to students by the third week of class. Your paper should include adequate detail concerning etiology, symptomatic expression, forms of medical treatment, progression and prognosis, interventions appropriate for psychologists and/or specialists in school psychology to use, and a clear demonstration of knowledge of course content. Your paper should be written in *strict* APA format (6<sup>th</sup> edition), and fully documented. Use 1” margins all the way around and 12-point, Times New Roman font, with no extra spaces between lines or paragraphs. Place it both in eCollege doc(ument) sharing and in the dropbox for week 15, PSY 515, Spring 2014.

### **Grading Procedures:**

The examinations and the paper will each count as 100 points (a total of 300 possible points). To get an A, you will need to earn 280 total points, and for a B you will need 240.

Here is the “rubric” by which I will assign you a score of up to 100 points on the papers you write:

<b>Question</b>	<b>No, or Almost Not at All</b>	<b>Partially</b>	<b>Almost Completely</b>
Did you introduce the reader comprehensively to the topic under investigation, and the empirical variables relevant to its understanding (especially – but not limited to – the neuroanatomical, physiological, and behavioral variables that are germane)?	0	10	15
Did you adequately describe the etiology of the disorder in a multidisciplinary fashion (structurally and physiologically)?	0	10	15
Did you adequately describe the defining symptoms of the disorder and related behavioral/psychological phenomena, including appropriate reference to the diagnostic procedures or operational definitions entailed?	0	10	15
Did you adequately describe the expected progression of the			

disorder and any variations therein?	0	7	10
Did you adequately describe the prognosis of the disorder and any variations therein?	0	7	10
Did you demonstrate knowledge of assessments and interventions appropriate for psychologists and specialists in school psychology to use with the disorder, identifying expected behavioral/psychological observations, changes, and undesirable side-effects?	0	7	10
Did you demonstrate adequate knowledge and use of course content in writing your paper?	0	7	10
Did you write your Introduction in clear English sentences, organized and unified by the purpose of your writing?	0	3	5
Does the paper comply <b>entirely</b> with APA format and style?	0	3	5
Did you attach a complete and adequate References section identifying all the works cited in the body of the paper, and of course prepared <b>entirely</b> with APA format and style?	0	2	5

Maximum points under the rubric = 100. The number of points you earn under the rubric will be your grade on the paper.

All other things being equal, you will perform better in this course if you come to class regularly. We are all adults and I understand that you may have many priorities, planned and unplanned, which exceed those of this course. Go, therefore, when you must, but note: Things happen in college classrooms which are crucial to becoming educated and for which it is difficult (perhaps impossible) to test. Sometimes these things are serendipitous and represent the most significant of our learnings; and of course in some class periods they may not happen at all. They usually are unpredictable and rely on spontaneous exchanges involving students and the professor. They may occur before the instructor arrives, or at a break. They are worth the wait and the intervening tedium. When you are absent – even if someone takes notes for you – you will miss them. To ensure that this vital part of your education is there for you, I will enforce the university's absence policy in the following way:

If you have excessive absences (either excused or unexcused), I will assign you a grade of "F" in this class. You may avoid this fate by officially dropping the course. For purposes of this policy, an absence occurs if you miss 10 or more minutes of a single class period, from the scheduled beginning (or my arrival, whichever is later) to the scheduled end of the period (or my dismissing you, whichever comes earlier). Absences become excessive as a direct function of how much actual class you are missing. Use the following table as a guide:

<b>Approximate Number of Scheduled Class Meetings</b>	<b>Minimum Number of Absences to Get an F</b>	<b>Warning Issued</b>
<b>15</b>	<b>4</b>	<b>with distribution of syllabus on eCollege effective the first class meeting (whether you read it, or attend class, or not)</b>

As noted elsewhere, some (but not all) work in this course may be made up if it was missed due to an excused absence. University policy permits the instructor of a class to define valid excuses for an absence. I include, in general the following things as valid reasons for missing a class:

- (1) participation in an authorized university activity;
- (2) illness of the student or a first-degree relative who cannot be provided *necessary* care without the student's missing class;
- (3) death in a student's immediate family; and

- (4) fulfilling one's legal responsibilities (jury duty, court hearings) as a citizen
- (5) documented alien abduction of (not by) the student lasting over 12 hours (3 hours if alien-induced pregnancy, or larval implantation, is documented).

Such excuses must be documented to my satisfaction, including support for the notion that you had no choices (e.g., alternative university activities, legal continuance, etc.). As noted in the table above, I will counsel you in some form as your absences accumulate to near critical levels. Wait a minute! You are already too close. Consider yourself warned.

### **Conduct:**

Admission and attendance in a college or university form an honor and a privilege. Where tuition and other expenses are subsidized, either by private or public funds, the person has received an additional trust that inherently entails conducting one's affairs as a student within the constraints of civil society. In this class I will expect you behave in a way that is respectful of others, their right to receive (and deliver) elements of a college education, and their identities as unique persons in the world. I expect us all to act toward others as we would like them to act toward us.

I will also expect you not to plagiarize, steal or otherwise procure tests or other class materials that are not supposed to be publicly available (including copyright violations), or cheat on examinations. I will give you an F for any of these actions, and I will make an appreciable effort to have you dismissed from the university.

Here are some other dos and don'ts that will also be a part of our code of conduct in class:

1. Far beyond the particulars of this course, do respect the divine principle of the universe, which seems to be detectable in other people. As one deity is said to have put it: "Inasmuch as you have done it to the least of these [e.g., other students and the teacher, other enemies], you have done it also to me."
2. Do remember that this course is about a limited area of empirical content; don't forget that there are bigger realities. This is just a course.
3. Don't talk trash in excess. Occasional right-brain language epithets may be okay for emphasis, but learn to use your language more elegantly than that (or remain silent).
4. Do take some time off from constant work during the semester. Do remember to reflect on things beyond the course. (This is not an injunction to ditch class, but rather a reminder to place your studies in perspective.)
5. Do let those who support and have supported your educational efforts know how much you appreciate them sometime during the term.
6. Don't attack the person of another member of the class.
7. Don't sexually (or otherwise) harass a member of the class.
8. Don't steal others' work (plagiarism is a capital crime around here!).
9. Don't distort the truth, about your data, its sources, or your colleagues.
10. Do be satisfied with where you are in your own professional development. Others may be farther along than you, but don't waste time envying them. Do work to become who you were meant to be.

Section 10 - Faculty are required to include in their course syllabi the following statement: Students requesting accommodations for disabilities must go through the Academic Support Committee. For more information, please contact the Director of Disability Resources and Services, Halladay Student Services Building, Room 303D, (903) 886-5835.

Section 11 - Faculty are required to include in their course syllabi the following statement: "All students enrolled at the University shall follow the tenets of common decency and acceptable

behavior conducive to a positive learning environment." (See Student's Guide Handbook, Policies and Procedures, Conduct)

**GUY TEACHING COURSE:**



Steve Ball

Associate Professor of Psychology

[academicstevie@yahoo.com](mailto:academicstevie@yahoo.com)

[steve.ball@tamuc.edu](mailto:steve.ball@tamuc.edu)

Office: Henderson 235

Phone (In Developmental Cognition Lab (which is also my office) – switches to fax after 7 rings, sometimes fewer): 903-886-5586 – go to Binnion 101 to find me during office hours or during another appointed time

Community Counseling & Psychology Clinic: Binnion 101 (903-886-5660)

Office Hours: by appointment (specific times to be determined after classes begin)

Class Schedule: PSY 508 Wednesday 720-1000 pm

PSY 515 Wednesday 430-710 pm

PSY 691 Clinic hours TBA ~Tuesday-Thursday 10 am-430 pm