

01-20c

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App 10/16/01  
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**CURRICULUM PROPOSAL COVER SHEET**  
University-Wide Undergraduate Curriculum Committee

**I. CONTACT**

Contact Person Raymond Pavloski (pavloski@grove.iup.edu) Phone 357-4523  
Department Psychology

**II. PROPOSAL TYPE (Check All Appropriate Lines)**

**COURSE** SENSATION/PERCEPTION  
Suggested 20 character title

New Course\* PSYC 359 Sensation and Perception  
Course Number and Full Title

Course Revision \_\_\_\_\_  
Course Number and Full Title

Liberal Studies Approval+  
for new or existing course \_\_\_\_\_  
Course Number and Full Title

Course Deletion \_\_\_\_\_  
Course Number and Full Title

Number and/or Title  
Change \_\_\_\_\_  
Old Number and/or Full Old Title

\_\_\_\_\_ New Number and/or Full New Title

Course or Catalog  
Description Change \_\_\_\_\_  
Course Number and Full Title

**PROGRAM:** \_\_\_\_\_ Major \_\_\_\_\_ Minor \_\_\_\_\_ Track

New Program\* \_\_\_\_\_  
Program Name

Program Revision\* \_\_\_\_\_  
Program Name

Program Deletion\* \_\_\_\_\_  
Program Name

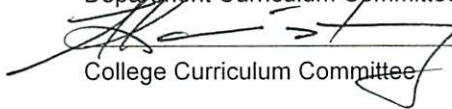
Title Change \_\_\_\_\_  
Old Program Name

\_\_\_\_\_ New Program Name

III. Approvals (signatures and date)

 2/8/01

Department Curriculum Committee


 03/23/01

College Curriculum Committee

+Director of Liberal Studies (where applicable)

 2/8/01

Department Chair

 3/27/01

College Dean

\*Provost (where applicable)



**Catalog Description**

PSYC 359      Sensation and Perception

3 lecture hours

2 lab hours

4 credits

(3c-2l-4sh)

Prerequisite:      PSYC 290

Introduces the biological and psychological processes that determine our perceptions and their relationships to physical properties of the environment. Laboratory work provides the opportunity to explore lecture and textbook topics first-hand, and to collect and analyze psychophysical data.

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**Justification**

Sensation and Perception are two basic psychological processes. A course devoted to these processes is not presently a part of our undergraduate curriculum although other basic processes are covered e.g. learning, cognition. The course will fill a gap in the present undergraduate curriculum. It will meet a distribution requirement for majors. All majors must choose one course in Group E. PSYC 359 will be added to this group, The Biological Bases of Behavior, reflecting the approach to the topic described in the syllabus of record.

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## Syllabus of Record

### I. Catalog Description

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Introduces the biological and psychological processes that determine our perceptions and their relationships to physical properties of the environment. Laboratory work provides the opportunity to explore lecture and textbook topics first-hand, and to collect and analyze psychophysical data.

### II. Course Objectives

1. Students will understand the importance of distinguishing properties of physical stimuli from those of psychological experience, and appreciate the deep issues involved.
2. Students will demonstrate knowledge of basic techniques and principles of psychophysics.
3. Students will demonstrate an understanding of differences between distal and proximal stimuli, transduction of physical stimuli to neural codes, and representation of physical properties in the brain, for each of the sensory systems.
4. Students will demonstrate knowledge of psychological principles that organize and give meaning to sensory-perceptual input.

### III. Course Outline

The course is divided into four sections, each followed by a non-comprehensive examination:

#### Part I. (10 lectures)

A. Sensation and Perception language, stimuli, transduction, brain processes and their levels, and construction of experience.

B. Research methods: Traditional psychophysics and signal detection theory. Psychophysical functions.

#### C. Vision 1

1. Basic neuron structure and function
2. Anatomy and physiology of the visual system

#### EXAMINATION 1 (1 lecture period)

#### Part II. (10 lectures)

#### A. Vision 2

1. Basic visual functions
2. Pattern perception
3. Distance (depth) and size perception
4. Color perception

#### EXAMINATION 2 (1 lecture period)

#### Part III. (10 lectures)

#### A. Vision 3

1. Perception of motion

#### B. Audition

1. Anatomy and physiology of the auditory system
2. Basic auditory functions
3. Auditory pattern perception

#### EXAMINATION 3 (1 lecture period)

#### Part IV. (9 lectures)

#### A. The Skin Senses

## B. The Chemical Senses

### C. Perceptual Development

#### EXAMINATION 4 (Final examination period)

##### Laboratory Exercises

Lab 1: Overview of interactive computer software and other lab materials.

Labs 2 and 3: Measuring sensory experience, classical psychophysical methods, and signal detection. Includes collection of length and area discrimination data and its description; the method of limits and calculation of the absolute threshold; signal detection methods including exploration of effects of changing signal intensity, noise level, and observer sensitivity, construction of noise and signal+noise distributions with probabilities of hits, misses, false alarms and correct rejections indicated, effects of criterion shifts on probabilities, and construction of receiver operating characteristic curves.

Lab 4. Basic neuron structure and function. Computer interactions are used to explore the major components of neurons and their functions. The origin of the resting potential is demonstrated. Summations of synaptic inputs and the action potential are demonstrated, and the basis of the action potential in ionic currents is explained.

Labs 5 and 6. Dark adaptation of rods and cones, V1 receptive fields, spatial frequency, and color and wavelength. Lecture material on the retinotopic organization of primary visual cortex and single neuron receptive fields are demonstrated using interactive computer animations. The behaviors of V1 neurons (X-type, simple, and complex cells) are illustrated. The concept of spatial frequency is introduced by having students manipulate square- and sine-wave grating patterns. The relationship of spatial frequency to receptive fields is demonstrated. Spectral colors and the responses of cones to them is illustrated. The Purkinje shift is demonstrated.

Lab 7. Basic visual processes. Students observe the consequences of viewing a ganzfeld. Mach band demonstrations and step tablets are given and related to neuron receptive fields. Simultaneous brightness contrast is demonstrated and related to mach bands and receptive fields. An approximation to stabilized retinal images is demonstrated. Various visual acuity tests are shown. Inverting and displacing goggles are demonstrated and related to basic visual functions.

Lab 8. Pattern perception. The relationship of viewing distance to spatial frequency and visual angle is demonstrated using interactive computer demonstrations. The Fourier synthesis of a square wave pattern from sine wave gratings is demonstrated. Students participate in spatial frequency adaptation.

Lab 9. Monocular distance cues. Interactive computer demonstrations of pictorial cues to distance are provided. Students experience negative afterimages and explore the relationship of apparent size of afterimages to perceived viewing distance. Motion parallax, the kinetic depth effect, and optical flow are explored using interactive demonstrations.

Labs 10 and 11. Stereopsis: Stereograms, autostereograms, and monocular versus binocular depth perception. Retinal disparity and its relationship to viewing distance is explored using interactive computer demonstrations. Students utilize stereoscopes to examine images with and without identifiable objects (random-dot stereograms), and unfusible images (binocular rivalry). The principles underlying autostereograms are explored using computer software that creates autostereogram depth bit maps from images created by the instructor and by students. Students collect data and participate in an experiment on the relative accuracy of monocular and binocular depth perception using a classic depth perception apparatus.

Lab 12. Color lab 1. The spectrum, wavelength, and reflectance curves are related to the psychological experience of color through interactive computer demonstrations. The color circle and color solid are demonstrated with computer graphics. Color mixing is demonstrated with computer demonstrations that allow students to experience colors produced by mixing different wavelengths (additive) and by mixing pigments with specified reflectance profiles (subtractive). The responses of S, M, and L cones to specific inputs and the resulting color experiences are demonstrated interactively.

Lab 13. Color lab 2. Opponent processes are explored with interactive computer demonstrations. They are combined with the trichromatic phenomena explored in the previous lab to demonstrate the principles behind synthesizing theories of color vision. Color vision pathologies and color afterimages and contrast are also demonstrated and explored by students.

Lab 14. Basic auditory functions. Relationships between properties of pure tones (frequency, amplitude, phase) and sound perception are demonstrated. Addition and subtraction of harmonics and the phenomenon of the missing fundamental are demonstrated. The perception of beating and its relationship to the relative frequencies of the constituent sine waves are demonstrated. Consonance and dissonance are explored. Shepard's continuously rising tones and other auditory illusions are demonstrated. Several auditory phenomena related to music (transposition, tonic context, differences in timbres, loudness, channels, melodies) are demonstrated.

## IV. Evaluation Methods

The final course grade is determined by the grades on four examinations that cover readings and lecture material, and on laboratory assignments. Exams count for 85% of the course grade, and lab assignments count for 15%. The course grade will be based on a traditional grading scheme (90-100%: A; 80-89%: B; 70-79%: C; 60-69%: D; and <60%: F).

The examinations will include various types of question (multiple choice, short answer, short essay, matching, labeling figures and graphs) as appropriate to the material being tested. Lab assignments include completion of computer-based activities, use of non-computer standard perception equipment, and typewritten answers to questions and reports based on lab activities.

## V. Required Textbook

Levine, M. (2000). Levine & Shefner's Fundamentals of Sensation and Perception (3<sup>rd</sup> Edition). New York: Oxford University Press.

## VI. Special Resource Requirements

Students are not expected to supply any materials or equipment. All laboratory materials are supplied by and are available in the Psychology Department.

## VII. Bibliography

### Books:

- Bruce, V., and Green, P. R. (1990). *Visual perception: Physiology, psychology and ecology* (2<sup>nd</sup> edition). Hillsdale, NJ: Lawrence Erlbaum.
- Coren, S., Ward, L. M. , and Enns, J. T. (1999). *Sensation and perception* (5<sup>th</sup> edition). New York: Harcourt Brace.
- Cornsweet, T. N. (1970). *Visual perception*. New York: Academic Press.
- Dowling, J. W., and Harwood, D. L. (1986). *Music cognition*. New York: Academic Press.
- Goldstein, E. B. (2002). *Sensation and perception* (6<sup>th</sup> edition). Belmont, CA: Wadsworth.
- Humphreys, G. W., and Bruce, V. (1989). *Visual cognition: Computational, experimental, and neuropsychological perspectives*. Hillsdale, NJ: Lawrence Erlbaum.
- Pinker, S. (Ed.) (1985). *Visual cognition*. Cambridge, MA: MIT Press.
- Schiffman, H. R. (2001) *Sensation and perception: An integrated approach* (5<sup>th</sup> edition). New York: John Wiley & Sons.
- Sekuler, R., and Blake, R. (1994). *Perception* (3<sup>rd</sup> edition). New York: Alfred A. Knopf.
- Wandell, B. A. (1995). *Foundations of vision*. Sunderland, MA: Sinauer.

### Internet Resources:

There is a plethora of internet animations and simulations of perceptual phenomena. The sites listed below have been stable for a period of several years (as of November, 2001), and are of high quality. A little searching will uncover many others.

The Joy of Visual Perception is a self-contained introduction to the field: [www.yorku.ca/eye/](http://www.yorku.ca/eye/)

Teaching resources for sensation and perception: [www.skidmore.edu/~hfoley/perception.htm](http://www.skidmore.edu/~hfoley/perception.htm)

Examples of recently-published research articles on vision: <http://www.journalofvision.org/1/2/>

Lightness perception and lightness illusions: <http://www-bcs.mit.edu/people/adelson/publications/gazzan.dir/gazzan.htm>

Wide-ranging demonstrations of visual phenomena: <http://www.sandlotscience.com/>

Stereoscopic depth perception: <http://www.ptc.tec.mn.us/cis/wit/>

Archives of articles published by Walter J. Freeman, many of which deal with the brain dynamics of perception:

<http://sulcus.berkeley.edu/FreemanWWW/manuscripts/wjfmanuscripts.html>

On-line exhibits of a variety of visual phenomena: <http://www.exploratorium.edu/exhibits/>

Brain physiology in vision: <http://retina.umh.es/webvision/index.html>

Examples of materials constructed using the computational approach to perception:

[http://www.cs.sfu.ca/~colour/data/colour\\_constancy\\_test\\_images/mondrian/index.html](http://www.cs.sfu.ca/~colour/data/colour_constancy_test_images/mondrian/index.html)

Links to perception tutorials and demonstrations: <http://psych.hanover.edu/Krantz/>

Motion perception: [http://www.biols.susx.ac.uk/home/George\\_Mather/Motion/index.html](http://www.biols.susx.ac.uk/home/George_Mather/Motion/index.html)

An interactive demonstration of the CIE color perception diagram: [http://www.biyee.net/v/cie31\\_charts.htm](http://www.biyee.net/v/cie31_charts.htm)

## Course Analysis Questionnaire

### A. Details of the Course

A1 This course meets a laboratory requirement for the B.A. degree in psychology. It is not intended for inclusion in the Liberal Studies program.

A2 This course does not require changes in any other courses or programs in the department.

A3 Two sections of this course were offered in the Spring, 2000 semester. Computer and other laboratory equipment requirements dictated that enrollment be set to the capacity of the laboratory. Originally, one section was offered. However, in order to meet the demands of students needing a psychology core area requirement course for graduation, a second section was opened. Both sections were filled. A third section is currently being offered with an enrollment of 16 students.

A4 This course is not intended to be dual level.

A5 This course is not to be taken for variable credit.

A6 Similar courses are offered in virtually every university and college psychology department. The following are representative examples:

The University of Pittsburgh:

Sensation and Perception: This course examines the nature of the mechanisms that transform sensory input into our perceptual experience of the world. Topics include: structure and function of sensory systems, perception of color, object, motion, pitch, etc. The emphasis is on how physiological mechanisms, with special attention to neural firing, result in our perception of the world. Format of the course will include lectures and discussion.

Edinboro University:

PSYC 410 Sensation and Perception [3 sem. hrs.]

This course addresses the question of how environmental stimuli give rise to sensory processes (sensation) and how these processes accrue meaning (perception). It presents classical and contemporary approaches to sensation and perception and explores the physiological bases of these processes for selected sensory modalities. Laboratory sessions illustrate the methods used to study perceptual processes. *Prerequisite: PS227.*

Millersville University:

PSYC 315: 4 s.h.

Sensation and Perception

A laboratory course designed to develop an understanding of the models and theories of the sensory and perceptual systems. 3 hours lecture, 2 hours lab. Offered annually. Prereq: PSYC 212.

A7 Neither the content of the course nor the skills taught are required or recommended by any professional or accrediting authority, law, or other external agency.

### B. Interdisciplinary Implications

B1 This course will be taught solely by a faculty member in the department of psychology.

B2 Given the nature of psychology and its deep relationships with biology, some overlap with courses offered in Biology is inevitable. However, there is no existing biology course which the proposed course will duplicate. Furthermore, examination of textbooks and of course offerings in other universities and colleges shows that Sensation and Perception textbooks are written by psychologists, and courses are offered in psychology departments.

B3 This is an upper-level course required for psychology majors. Any student who meets the course prerequisites can be admitted. Thus, it is unlikely that any Continuing Education students would be qualified/interested.

### C. Implementation

C1 No new faculty are required to teach this course. Dr. Pavloski has taught two sections of the course (as Special Topics) in the Spring, 2000 semester and is currently teaching one section in the Fall, 2000 semester. His schedule will accommodate three sections of the course each academic year. That is, no reductions in the frequencies of other course offerings are necessitated by this new course.

C2 Current resources are adequate for this course as a result of the Uhler Hall renovations. A classroom/laboratory enables both demonstrations and both computer-based and other types of laboratory activities. The psychology department has equipped the Sensation and Perception lab with standard demonstration equipment for visual, auditory, and haptic demonstrations and lab exercises.

Library holdings are adequate, and no travel funds are necessary.

C3 No grant funds are associated with this course.

C4 The course will be offered three times per year.

C5 One section will be offered in Fall semesters, and two in Spring semesters.

C6 The limit for enrollment will be set by the number of computers and other required equipment available in the laboratories, and by the associated software licenses.

C7 There are no limitations on course enrollments recommended by any professional societies of which the psychology faculty are aware.

### D. Miscellaneous

No additional information is necessary.





Honoring Yesterday  
Creating Tomorrow

# Indiana University of Pennsylvania

Department of Biology  
Weyandt Hall, Room 114  
975 Oakland Avenue  
Indiana, Pennsylvania 15705-1090

724-357-2352  
Fax: 724-357-5700  
Internet: <http://www.iup.edu/bi/>

February 8, 2001

Dr. Mary Lou Zanich, Chair  
Department of Psychology  
101 Uhler Hall  
Indiana University of Pennsylvania  
Indiana, PA 15701

Dear Mary Lou,

I am writing to indicate the support of the Department of Biology for the course proposal for "Sensation and Perception" PSYC 359 written by Dr. Ray Pavloski. According to Dr. Andy Browe of our department; "The content of this new course is fundamentally different from the content of the Neurobiology (BIOL 482) course offered by the Department of Biology. There is, of course, some natural overlap of a few topics, but the overall nature of this new course is distinct and offers a unique and complimentary perspective on this aspect of human behavior."

I therefore support it and hope that it will soon become a part of your curriculum.

Sincerely,

W. Barkley Butler, Chair

cc: A.C. Browe  
A. Kaniasty