



**College of Health and Human Services  
Department of Communication Sciences and Disorders**

**CSD 405: Neurological Foundations of Speech, Language, and Hearing  
3 credit hours**

**GENERAL INFORMATION**

**Name of College:** College of Health and Human Services

**Name of Department:** Communication Sciences & Disorders

**Course:** CSD 405: Neurological Foundations of Speech, Language, and Hearing

**Semester/Year:** Fall 2022

**Credit hours:** 3

**Class time:** TuTh 9:35 - 10:50 AM

**Location:** W.A. Franke Coll Business, Rm 346

**Office hours:** Weds. 2-3 pm on zoom:

<https://nau.zoom.us/j/88204815654?pwd=ZVlEWVhxTno1ZmFHS284VUxsUXBvdz09>

Password: 405

**Course Prerequisites:** Anatomy and Physiology for Speech-Language Pathologists, or its equivalent.

**Course Instructor:** Sandy Stewart, Ed.D., CCC-SLP

**Contact Information:** [Sandra.L.Stewart@nau.edu](mailto:Sandra.L.Stewart@nau.edu); 928-523-7393 or 928-266-2585 (texting is fine)

**Course Purpose**

This course provides introductory information regarding the normal human brain and its contribution to communication. Areas covered will include general organization of the central and peripheral nervous systems, general function of the central and peripheral nervous systems, ascending and descending sensory/motor pathways, the relationships of these pathways to higher cortical function, and more specifically, the relationship of these systems to communication.

**Student Learner Outcomes**

This course has been designed to ensure that students demonstrate required knowledge and skills as outlined in the Standards and Implementation Guidelines for the Certificate of Clinical Competence in Speech-Language Pathology. The specific standards addressed in this course are: IV-A, IV-B, IV-C

The student will be able to:

1. Compare and contrast the cells of the nervous system. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.

2. Categorize the structures of the peripheral and central nervous systems according to level and function, and relate to behaviors, including communication function. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
3. Describe the arterial systems of the brain, and suggest possible outcomes following damage to specific areas. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
4. Describe the neural and muscular mechanisms involved in muscle activation. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
5. Describe the functional neuroanatomy and neurophysiology of the sensory systems. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
6. Compare and contrast the sensory systems and explain their roles in behavior. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
7. Evaluate the role of various cortical areas in the control of higher cognitive functioning. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
8. Develop a theoretical and practical knowledge of the neurological systems of communication. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.
9. Apply theoretical and practical knowledge of normal communication function to communication disorders. (Standards IV-A, IV-B, IV-C)
  - Knowledge will be conveyed through written class lecture, readings, and web-site readings and interactions. Acquisition will be demonstrated through class discussion, assignments, and tests.

### **ASHA Standards (2020)**

#### **Standard IV-A**

The applicant must have demonstrated knowledge of the biological sciences, physical sciences, statistics, and the social/behavioral sciences.

### Standard IV-B

The applicant must demonstrate knowledge of basic human communication and swallowing processes, including the appropriate biological, neurological, acoustic, psychological, developmental, and linguistic and cultural bases. The applicant must have demonstrated the ability to integrate information pertaining to normal and abnormal human development across the life span.

### Standard IV-C

The applicant must demonstrate knowledge of communication and swallowing disorders and differences, including the appropriate etiologies, characteristics, anatomical/physiological, acoustic, psychological, developmental, and linguistic and cultural correlates in the area of communication disorders.

### **Course Structure:**

This course will focus on the systems responsible for normal communication, and apply the principles of these systems to communication in the areas of vestibular function, auditory function, and speech and language function. The course will involve lectures, readings, assignments, discussions, and tests.

Because the information covered in this course can be complex, students will be encouraged to approach course information in several ways:

### **Lectures**

Each learning module will involve lecture over several class periods, which will be summarized in one or more PowerPoints, made available to students when the module opens.

### **Readings**

Learning modules have associated readings from the text (if purchased).

### ***Text (optional)***

Webster, D.B. (1999). Neuroscience of Communication: Second Edition. Singular Publishing Group: San Diego.

### **Assessment of Learner Outcomes**

#### Tests

Three tests will be given to evaluate your knowledge of the subject matter. Tests will emphasize material covered in the lectures, study questions, atlases, terminology, and class assignments.

**Test 1 will cover Modules 1, 2, and 3; Test 2 will cover Modules 4, 5, and 6; and Test 3 will cover Modules 7, 8, and 9.** Although Test 3 will be given during the last week, it will not be cumulative per se, i.e., you will not need to respond to specific information covered earlier in the semester. However, note that the content covered in this course itself IS cumulative: You must

understand and apply information covered earlier in the semester to understand the information covered in the last section of the course. Make sure that you stay on top of material.

Tests will be comprised of materials drawn from the module terminology, study questions, atlases, and assignments. Students can count on being asked to label at least two pictures from the module atlases, and respond in short answer form to 2-3 study questions. As such, tests will include multiple choice and matching items, as well as diagrams to be labelled and short answer questions. Tests will be administered in class, but online through BbLearn.

### Terminology

Like all sciences, neuroscience has its own lexicon that must be understood by students for continued success in the class. For this reason, a list of pertinent terms and their definitions has been made available for each module in the BbLearn class shell. Weekly quizzes will take place during the first 10 minutes of each Thursday class and will cover terminology since the last quiz – note that the instructor may include an atlas to label but will announce the atlas picture prior to the quiz. Students will not be tested over terminology that has not been introduced in class. It will not be possible to make up quizzes, so if a student needs to miss class, it would be wise to contact the instructor at least 24 hours in advance.

### Assignments

Assignments are located in BbLearn in the appropriate module folders. Assignments are not timed, and may be reopened until you click "submit". They may be taken an unlimited number of times, and the highest grade will be recorded. Although assignments can be taken an unlimited number of times, all assignments should be taken for the first time by Sunday at midnight of the week that a Module is completed. Students should be aware that questions will be drawn from assignments for each test.

### Short Answer Questions

In each module folder, students will find 3-4 short-answer questions intended to support the learning of conceptual material in the class. Although student responses to these questions will not be graded on a weekly basis, students will be asked to answer 2-3 of these questions on each test.

### Atlases

Because a basic understanding of neuroanatomy is fundamental to success in this class, an atlas of diagrams has been developed for each module, available online in the designated module folder. Each picture in the atlas has been designed to test the student's knowledge regarding structures or pathways under discussion in class. At least two diagrams, and as many as three, will be included in each test.

### Extra credit

Students interested in extra credit may work either alone or with a partner to present a "5-minute factoid" to the class. To accomplish this, students will be asked to find a unique fact or answer an interesting question about the nervous system that has NOT been covered in class, using current and reliable source materials. Students should plan on sharing this information in a thoughtful but conversational way with the class for no more than about 5 minutes. Students will also

submit a brief typed summary of the factoid to the professor on the day of the presentation, including relevant source material, referenced in APA format. This presentation will be worth up to 10 points for each participant, which will be added to the last test score.

### **Grades**

Your grade will be based on the following:

Weekly terminology quizzes	15%
Assignments	25%
Tests 1 - 3:	60%

Letter grades will be assigned as follows:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	Below 60%

**Office hours:** As a way of making sure that you have a chance to ask questions about materials or course assignments, I'll be holding zoom office hours to answer questions every Weds from 2:00-3:00 pm, or by appointment. You can pop in anytime you want during those hours. Of course, you are always welcome to email questions - this is just another avenue for understanding available to you.

Time: Weds 2-3 pm AZ time

Join Zoom Meeting

<https://nau.zoom.us/j/88204815654?pwd=ZVlEWVhxTno1ZmFHS284VUxsUXBvdz09>

Meeting ID: 882 0481 5654

Password: 405

**Course Outline:**

**See next page**

<b>Topic – Section I</b>	<b>Assignments / Tests</b>
Module 1: <ul style="list-style-type: none"> <li>❖ Introduction to Neuroscience</li> </ul>	Assignment 1
Module 2: <ul style="list-style-type: none"> <li>❖ Nerve cells &amp; muscles</li> <li>❖ Development of the nervous system</li> </ul>	Assignment 2
Module 3: <ul style="list-style-type: none"> <li>❖ Gross anatomy of the brain</li> <li>❖ Vascular &amp; CSF supply</li> </ul>	Assignment 3 Test 1
<b>Topic - Section II</b>	
Module 4: <ul style="list-style-type: none"> <li>❖ Internal organization of the brainstem and cerebellum</li> <li>❖ Cranial nerves</li> </ul>	Assignments 4.1, 4.2, 4.3
Module 5: <ul style="list-style-type: none"> <li>❖ Internal organization of the forebrain</li> </ul>	Assignment 5
Module 6: <ul style="list-style-type: none"> <li>❖ Sensory systems</li> <li>❖ The vestibular system</li> <li>❖ The auditory system</li> </ul>	Assignment 6.1, 6.2 Test 2
<b>Topic - Section III</b>	<b>Assignments / Tests</b>
Module 7: <ul style="list-style-type: none"> <li>❖ Cortical organization of speech perception</li> </ul>	Assignment 7
Module 8: <ul style="list-style-type: none"> <li>❖ Cortical organization of language</li> </ul>	Assignment 8.1, 8.2

Topic – Section I	Assignments / Tests
Module 9: ❖ Speech production ❖ Recovery of function	Assignment 9.1, 9.2 Test 3

## COVID-19 REQUIREMENTS AND INFORMATION

Additional information about the University’s response to COVID-19 is available from the Jacks are Back! webpage located at <https://nau.edu/jacks-are-back>.

### Other Student Expectations

#### Communication

There are a variety of ways to contact the instructor:

- Email me at [Sandra.L.Stewart@nau.edu](mailto:Sandra.L.Stewart@nau.edu) anytime.
- If you have a problem of a more immediate nature, you may call me at 928-523-7393 or 928-266-2585 (text is fine).
- Office hours will be MWF 10:00 am – 11:30 pm, TTh 2 pm – 4 pm.

#### Student Work Responsibility

Self-study and independent learning are key to success in any academic course. You are responsible for attending classes, and completing all work in a timely manner. If you should encounter problems that interfere with or potentially interfere with your ability to fulfill the course requirements, *please notify me as soon as possible*. Please do not wait until the conclusion of the semester to explain any interruptions and/or disruptions to your studies.

### University Policies:

#### **Academic Integrity**

NAU expects every student to firmly adhere to a strong ethical code of academic integrity in all their scholarly pursuits. The primary attributes of academic integrity are honesty, trustworthiness, fairness, and responsibility. As a student, you are expected to submit original work while giving proper credit to other people’s ideas or contributions. Acting with academic integrity means completing your assignments independently while truthfully acknowledging all sources of information, or collaboration with others when appropriate. When you submit your work, you are implicitly declaring that the work is your own. Academic integrity is expected not only during formal coursework, but in all your relationships or interactions that are connected to the educational enterprise. All forms of academic deceit such as plagiarism, cheating, collusion, falsification or fabrication of results or records, permitting your work to be submitted by another, or inappropriately recycling your own work from one class to another, constitute academic misconduct that may result in serious disciplinary consequences. All students and faculty members are responsible for reporting suspected instances of academic misconduct. All students

are encouraged to complete NAU's online academic integrity workshop available in the E-Learning Center and should review the full academic integrity policy available at <https://policy.nau.edu/policy/policy.aspx?num=100601>.

### **Course Time Commitment**

Pursuant to Arizona Board of Regents guidance (Academic Credit Policy 2-224), for every unit of credit, a student should expect, on average, to do a minimum of three hours of work per week, including but not limited to class time, preparation, homework, and studying.

### **Disruptive Behavior**

Membership in NAU's academic community entails a special obligation to maintain class environments that are conducive to learning, whether instruction is taking place in the classroom, a laboratory or clinical setting, during course-related fieldwork, or online. Students have the obligation to engage in the educational process in a manner that does not breach the peace, interfere with normal class activities, or violate the rights of others. Instructors have the authority and responsibility to address disruptive behavior that interferes with student learning, which can include the involuntary withdrawal of a student from a course with a grade of "W". For additional information, see NAU's disruptive behavior policy at <https://nau.edu/university-policy-library/disruptive-behavior>.

### **Nondiscrimination and Anti-Harassment**

NAU prohibits discrimination and harassment based on sex, gender, gender identity, race, color, age, national origin, religion, sexual orientation, disability, or veteran status. Due to potentially unethical consequences, certain consensual amorous or sexual relationships between faculty and students are also prohibited. The Equity and Access Office (EAO) responds to complaints regarding discrimination and harassment that fall under NAU's Safe Working and Learning Environment (SWALE) policy. EAO also assists with religious accommodations. For additional information about SWALE or to file a complaint, contact EAO located in Old Main (building 10), Room 113, PO Box 4083, Flagstaff, AZ 86011, or by phone at 928-523-3312 (TTY: 928-523-1006), fax at 928-523-9977, email at [equityandaccess@nau.edu](mailto:equityandaccess@nau.edu), or via the EAO website at <https://nau.edu/equity-and-access>.

### **Title IX**

Title IX is the primary federal law that prohibits discrimination on the basis of sex or gender in educational programs or activities. Sex discrimination for this purpose includes sexual harassment, sexual assault or relationship violence, and stalking (including cyber-stalking). Title IX requires that universities appoint a "Title IX Coordinator" to monitor the institution's compliance with this important civil rights law. NAU's Title IX Coordinator is Pamela Heinonen, Director of the Equity and Access Office located in Old Main (building 10), Room 113, PO Box 4083, Flagstaff, AZ 86011. The Title IX Coordinator is available to meet with any student to discuss any Title IX issue or concern. You may contact the Title IX Coordinator by phone at 928-523-3312 (TTY: 928-523-1006), by fax at 928-523-9977, or by email at [pamela.heinonen@nau.edu](mailto:pamela.heinonen@nau.edu). In furtherance of its Title IX obligations, NAU will promptly investigate and equitably resolve all reports of sex or gender-based discrimination, harassment,

or

sexual misconduct and will eliminate any hostile environment as defined by law. Additional important information about Title IX and related student resources, including how to request immediate help or confidential support following an act of sexual violence, is available at <http://nau.edu/equity-and-access/title-ix>.

### **Accessibility**

Professional disability specialists are available at Disability Resources to facilitate a range of academic support services and accommodations for students with disabilities. If you have a documented disability, you can request assistance by contacting Disability Resources at 928-523-8773 (voice), 928-523-6906 (TTY), 928-523-8747 (fax), or [dr@nau.edu](mailto:dr@nau.edu) (e-mail). Once eligibility has been determined, students register with Disability Resources every semester to activate their approved accommodations. Although a student may request an accommodation at any time, it is best to initiate the application process at least four weeks before a student wishes to receive an accommodation. Students may begin the accommodation process by submitting a self-identification form online at <https://nau.edu/disability-resources/student-eligibility-process> or by contacting Disability Resources. The Director of Disability Resources, Jamie Axelrod, serves as NAU's Americans with Disabilities Act Coordinator and Section 504 Compliance Officer. He can be reached at [jamie.axelrod@nau.edu](mailto:jamie.axelrod@nau.edu).

### **Responsible Conduct of Research**

Students who engage in research at NAU must receive appropriate Responsible Conduct of Research (RCR) training. This instruction is designed to help ensure proper awareness and application of well-established professional norms and ethical principles related to the performance of all scientific research activities. More information regarding RCR training is available at <https://nau.edu/research/compliance/research-integrity>.

### **Sensitive Course Materials**

University education aims to expand student understanding and awareness. Thus, it necessarily involves engagement with a wide range of information, ideas, and creative representations. In their college studies, students can expect to encounter and to critically appraise materials that may differ from and perhaps challenge familiar understandings, ideas, and beliefs. Students are encouraged to discuss these matters with faculty.