SYLLABUS

Name of Course: PERIPHERAL NEUROANATOMY (PNS) – ANAT-114

Length of Course: 3 units, 44 hours (4 hours lecture/week)

Course Description: This course covers the anatomy and function of the peripheral nervous system. The innervation of the upper and lower extremities will be covered in detail, as will the anatomy & function of the cranial nerves and autonomic nervous system.

Prerequisites: ANAT-137, ANAT-637

Course Offered by: Department of Basic Sciences

Required Text: Strutin N**.** PNS class notes (Canvas)
Felton DL,. *Netter's Atlas of Neuroscience*. 2nd ed. 2010

Recommended Text: Waxman SG. *Clinical Neuroanatomy.* 27th ed., 2013
Warfel J. Extremities: Muscles and Motor Points, 6th ed. 1993
Marieb EM. *Human Anatomy & Physiology*. 8th ed. 2009
Moore KL. *Clinically Oriented Anatomy*. 2013
Blumenfeld H. *Neuroanatomy Through Clinical Cases*. 2nd ed. 2010

Reference Texts: Strandring S. *Gray's Anatomy*. 40th ed. 2008

Materials: Handouts may be provided

Method of Instruction: Lecture, assignments (in-class & homework

Evaluation/Grading Criteria:

MT 1:	25%
MT 2:	25%
Final (cumulative):	50%

Midterm exams may contain multiple-choice questions, T/F questions, labeling, short-answer, or written questions.

Final grades will be determined according to the following scale:

A – 4.0 Superior Work 90-100%
B – 3.0 Above Average work 80-89%
C – 2.0 Average work 70-79%
F 0 – 69%

In order to maintain satisfactory Academic Progress, a student must maintain a 2.0 or better in each and every course. Any grade less than a C must be remedied by repeating the class.

Grades and the Grading System Final Grades are available online through the CAMS student portal. If there are any questions on grading procedures, computation of grade point average, or the accuracy of the grade report, please contact the Registrar's Office or the Office of Academic Affairs. Grades will be reported and evaluation will be based on the Academic Policies, Procedures, & Services. Please refer to Evaluation Policy **(Policy ID: OAA.0007)**

In order to maintain **Satisfactory Academic Progress**, a student must maintain a 2.0 or better in each and every course. **Any grade less than a C must be remedied by repeating the class.** Please refer to Satisfactory Academic Progress **(Policy ID: OAA.0006)**

Attendance: Please refer to Attendance Policy (**Policy ID: OAA.0002**)

Conduct and Responsibilities: Please refer to the Personal Conduct, Responsibility and Academic Responsibility Policy (**Policy ID: OAA.0003**)

Make-up Exams: Please refer to Make-up Assessment Policy (**Policy ID: OAA.0001**)

Request for Special Testing: Please refer to Request for Special Testing (**Policy ID: OAA.0004**)

Accommodation for Students with Disabilities:

If you have approved accommodations, please make an appointment to meet with your instructor as soon as possible. If you believe you require an accommodation, but do not have an approved accommodation letter, please see the Academic Counselor Lori Pino in the Office of Academic Affairs. Contact info: Lpino@lifewest.edu or 510-780-4500 ext. 2061. Please refer to Service for Students with Disabilities Policy (**Policy ID: OAA.0005**)

Electronic Course Management:

Canvas is LCCW's Learning Management System (LMS). Canvas will be used throughout the quarter during this course. Lectures, reminders, and messages will be posted. In addition, documents such as the course syllabus and helpful information about the class project will be posted. Students are expected to check Canvas at least once a week in order to keep updated. The website address for Canvas is https://lifewest.instructure.com/login/canvas Please refer to the Educational Technologies Policy (**Policy ID: OAA.0009)**

Course Goal: The goal of this course is to provide the student with a thorough understanding of the portion of the nervous system which connects the brain and spinal cord with various receptors, muscles, organs, and glands. A detailed understanding of the innervation of the upper and lower extremities, cranial nerve innervation, and the structure and function of the autonomic nervous system will provide the student the basis necessary to progress through the neurologic examination and diagnosis portions of the curriculum and clinical practice.

Course Objectives:

Week 1-2: PNS Introduction/Overview

* to describe the anatomic relations & inter-relations of the CNS & PNS
* to identify the structures that constitute the PNS
* to illustrate the formation of the spinal nerve from ventral & dorsal roots, and the branches of the spinal nerve
* to discuss spinal nerve relations to vertebra, discs, and IVFs
* to define "radiculopathy", list them by order of commonality, and identify conditions which may cause compression of spinal nerves
* to introduce the concept of a "plexus", and to introduce their formation from the anterior rami of spinal nerves
* to identify the spinal nerves which form the cervical, brachial, lumbar, spinal, and pudendal plexuses
* to describe/illustrate the spinal cord origin of sympathetic innervation of the extremities, and how they contribute to cervical and lumbosacral spinal nerves by way of the sympathetic paravertebral chain
* to compare the basic anatomy of the somatic motor and visceral motor systems

Week 3-4: Innervation of the upper extremity

* to initially provide an overview of the innervation of the upper extremity
* to discuss the cervical spinal nerve innervation of the upper extremity
* to discuss the neurologic functions of the C5-T1 spinal nerves (sensory, motor, reflex)
* to discuss cervical radiculopathy (levels commonly affected, causes)
* to describe/illustrate the brachial plexus (formation, anatomic relations)
* to discuss injuries/disorders of the brachial plexus (TOS syndrome, Erb's palsy, etc.)
* to list the various peripheral nerve branches of the brachial plexus, and to list their functions
* to describe/illustrate the 5 main/terminal branches of the brachial plexus which innervate the upper extremity, and to discuss their functions in detail
* to describe/illustrate common sites of peripheral nerve compression and their neurologic consequences

Week 5: Innervation of the upper extremity (continued); Midterm 1

Week 6-7: Innervation of the lower extremity

to initially provide an overview of the innervation of the lower extremity
* to discuss the lumbosacral spinal nerve innervation of the lower extremity
* to discuss the neurologic functions of the L1-S2 spinal nerves (sensory, motor, reflex)
* to discuss lumbosacral radiculopathy (levels commonly affected, causes)
* to describe/illustrate the lumbar plexus (formation, anatomic relations)
* to list the various peripheral nerve branches of the lumbar plexus, and to list their functions
* to describe/illustrate the branches of the lumbar plexus which innervate the lower extremity, and to discuss the functions of the major branches in detail

* to describe/illustrate the branches of the sacral plexus, and to discuss the functions of the major branches in detail
* to describe/illustrate common sites of peripheral nerve compression and their neurologic consequences

Week 8: Cervical plexus & Thoracic spinal nerves/Intercostal nerves

* to describe/illustrate the formation of the cervical plexus
* to describe/illustrate the cutaneous areas of the head, neck, and shoulder innervated by the sensory branches of the cervical plexus
* to discuss the spinal origin of the phrenic nerve spinal origins, and its innervation of the diaphragm
* to briefly identify the motor branches of the cervical plexus
* to discuss the intercostal nerves
* to describe/illustrate the thoracic dermatomes
*to discuss herpes zoster (shingles)
*to review sympathetic thoraco-lumbar outflow, paravertebral chain, pre-vertebral ganglia
* to introduce the ANS as the visceromotor system, and to contrast it with the somatomotor system structure and function
* to describe the 2-neuron ANS pathway which connects the CNS to the target tissues (pre-ganglionic & post-ganglionic neurons)
* to identify the 2 divisions of the ANS (parasympathetic & sympathetic) and to compare/contrast their neurotransmitters, structures innervated, & functions
* to describe/illustrate, and contrast, the locations of the ganglia of the sympathetic and parasympathetic divisions of the ANS
* to discuss the sympathetic paravertebral chain, and to discuss the 4 different things sympathetic fibers may do as they enter the chain
* to discuss how sympathetic fibers travel to the head/face, and extremities
* to name the sympathetic pre-vertebral ganglia, discuss the spinal levels which contribute fibers to each ganglion, and to discuss the organs innervated from each ganglion
* to describe cranial nerve parasympathetic output, their target organs, and functions
* to describe how sacral parasympathetics travel down the cauda equina, to identify the organs innervated, and to discuss the potential clinical manifestations of cauda equina syndrome

Week 9: MT 2; Cranial nerves

* to present a table which summarizes the naming, numbering, components and functions of the twelve pairs of cranial nerves.
* to identify the cranial nerves with parasympathetic output, and their targets and functions
* to describe/illustrate the visual pathway from retina to visual cortex
* to identify the 6 extraocular muscles, their cranial nerve innervation, and their functions
* to discuss the functions of the trigeminal nerve (sensory, motor, reflex)
* to discuss the functions of the facial nerve (motor, sensory, reflex).
* to discuss the sensory functions of CN VIII
* to describe the functions of CNs IX, X,
* to describe the functions of CNs XI, XII

Week 10: Cranial nerves (continued); further discussion of ANS (as time allows)

Student Learning Outcomes (SLOs):
The student will be able to:

Spinal nerves:
* discuss spinal nerves relative to their formation, branches, and relations to discs and IVFs [PLO: 1]
* discuss the specific sensory, motor, and reflex functions of the C5-T1, and L1-S2, and S2-4 spinal nerves [PLO: 1, 4, 8]

Plexuses:
* discuss the significance of plexuses in the formation of peripheral nerves of the head/neck, upper and lower extremities [PLO: 1]
* describe/illustrate the cervical, brachial, lumbar, and sacral plexuses, and identify the major peripheral nerve branches of each plexus [PLO: 1]

Peripheral nerves:
* list the peripheral nerves which innervate the upper and lower extremities, and discuss their specific sensory, motor, and reflex functions [PLO: 1,4]
* identify common sites of potential entrapment/compression for each peripheral nerve, and discuss their clinical consequences [PLO: 1, 2, 4, 8]

Cranial nerves:
* name the cranial nerves, identify the cranial foramen which each nerve traverses, and discuss the structures innervated [PLO: 1]
* discuss the specific functions of each nerve, and the consequences of neural compromise [PLO: 1,4.8]

ANS
* discuss the general structure and function of ANS, and the specific structure and functions of the sympathetic and parasympathetic divisions [PLO: 1. 10]
* trace the pathway from the CNS to the effector organ for any sympathetic or parasympathetic function indicating the origin, route and termination of the preganglionic neuron and post-ganglionic neuron [PLO: 1, 8]
* discuss the clinical features of Horner's syndrome [PLO: 1]
* discuss the clinical features of cauda equina syndrome {PLO: 1, 3, 4, 5, 8]

Program Learning Outcomes (PLO): Students graduating with a Doctor of Chiropractic degree will be proficient in the following:

1. **ASSESSMENT AND DIAGNOSIS:** An assessment and diagnosis requires developed clinical reasoning skills. Clinical reasoning consists of data gathering and interpretation, hypothesis generation and testing, and critical evaluation of diagnostic strategies. It is a dynamic process that occurs before, during, and after the collection of data through history, physical examination, imaging, laboratory tests and case-related clinical services.
2. **MANAGEMENT PLAN:** Management involves the development, implementation and documentation of a patient care plan for positively impacting a patient's health and well-being, including specific therapeutic goals and prognoses. It may include case follow-up, referral, and/or collaborative care.
3. **HEALTH PROMOTION AND DISEASE PREVENTION:** Health promotion and disease prevention requires an understanding and application of epidemiological principles regarding the nature and identification of health issues in diverse populations and recognizes the impact of biological, chemical, behavioral, structural, psychosocial and environmental factors on general health.
4. **COMMUNICATION AND RECORD KEEPING**: Effective communication includes oral, written and nonverbal skills with appropriate sensitivity, clarity and control for a wide range of healthcare related activities, to include patient care, professional communication, health education, and record keeping and reporting.
5. **PROFESSIONAL ETHICS AND JURISPRUDENCE**: Professionals comply with the law and exhibit ethical behavior.
6. **INFORMATION AND TECHNOLOGY LITERACY**: Information literacy is a set of abilities, including the use of technology, to locate, evaluate and integrate research and other types of evidence to manage patient care.
7. **CHIROPRACTIC ADJUSTMENT/MANIPULATION**: Doctors of chiropractic employ the adjustment/manipulation to address joint and neurophysiologic dysfunction. The adjustment/manipulation is a precise procedure requiring the discrimination and identification of dysfunction, interpretation and application of clinical knowledge; and, the use of cognitive and psychomotor skills.
8. **INTERPROFESSIONAL EDUCATION**: Students have the knowledge, skills and values necessary to function as part of an inter-professional team to provide patient-centered collaborative care. Inter-professional teamwork may be demonstrated in didactic, clinical or simulated learning environments.
9. **BUSINESS**: Assessing personal skills and attributes, developing leadership skills, leveraging talents and strengths that provide an achievable expectation for graduate success. Adopting a systems-based approach to business operations. Networking with practitioners in associated fields with chiropractic, alternative medicine and allopathic medicine. Experiencing and acquiring the hard business skills required to open and operate an on-going business concern. Participating in practical, real time events that promote business building and quantifiable marketing research outcomes
10. **PHILOSOPHY:** Demonstrates an ability to incorporate a philosophically based Chiropractic paradigm in approach to patient care. Demonstrates an understanding of both traditional and contemporary Chiropractic philosophic concepts and principles. Demonstrates an understanding of the concepts of philosophy, science, and art in chiropractic principles and their importance to chiropractic practice.