

# ***WE Movement Neuroscience w/ Lab***

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Class Assembly: MG 1098

Course Credit: 3.0 semester hours

## **REQUIRED Text**

Neuroscience: Exploring the Brain by Bear, Connors and Paradiso (3<sup>rd</sup> edition)

## **Supplementary Material**

Recorded audio-PowerPoint linked lectures available on Blackboard.

MS PowerPoint presentations are provided on Blackboard.

Additional readings in PDF format, as distributed via email/Blackboard.

## **Course Objectives**

- 1) **Information Processing:** The primary focus of this course is the delivery of knowledge relative to the basic structures and mechanisms involved in the control of human voluntary movement, as well as the principles and theories of motor skill acquisition. Thus, the opportunities for learning focus upon a lecture-oriented class as recorded in a C-level smart classroom. This course will progress from basic cellular physiology to the complex behavioral outcomes and disorders of the human motor control system.
- 2) **Practical Application:** The laboratory section of this course provides the opportunity to actively apply the concepts learned in the information processing portion of the course.
- 3) **Writing Enhancement:** The ability to generate meaningful, succinct written communication. This will be performed through revisions of reflection papers of particular readings.

## **Course Outcomes**

Upon completion of this course the student will be able to:

- 1) identify and discuss neuroanatomical structures and their related functions
- 2) appreciate the interrelationships among neurological structures
- 3) understand the various means through which neural transmission of information is achieved
- 4) realize the interrelationships among the central nervous system, peripheral nervous system and musculoskeletal system
- 5) discuss the contributions of each major sensory system to motor system function
- 6) describe how each of these major topics impacts posture and locomotion
- 7) understand and discuss the symptoms, pathology, and current therapies regarding several neurodegenerative diseases (i.e. Parkinson's disease, Alzheimer's disease, ALS)

**External Standards**

- 1.1.22 Knowledge of twitch, summation, and tetanus with respect to muscle contraction.
- 1.1.5 Knowledge of the interrelationship among center of gravity, base of support, balance, stability, and proper spinal alignment.

**Internal Standards**

Outcome 1: Develop the ability to assimilate, synthesize, and apply information

- 1. Analysis and comparison of movements for specific exercise science principles
- 2. Ability to gather information from reliable sources
- 3. Produce a written document that pulls from multiple disciplines
- 4. Apply exercise principles to modify movement characteristics
- 5. Ability to evaluate information from other disciplines
- 6. Ability to understand the multiple factors that influence person's behavior
- 7. Compile/synthesize information that clearly integrates multiple disciplines

Outcome 2: Appreciate the need to maintain current knowledge in the field and develop the skills necessary to maintain that knowledge

- 1. Utilize current knowledge to evaluate quality of information
- 2. Knowledge of how to use a reputable search engine
- 3. Ability to critically examine and comprehend research
- 5. Knowledge of reputable journals and other sources in the field
- 7. Integrate reputable sources into a written or oral artifact
- 8. Ability to demonstrate the appropriate use of technology

Outcome 3: Become critical thinkers, consumers, and practitioners of research and statistical analysis

- 1. Demonstrate knowledge of research design and implementation
- 2. Demonstrate ability to apply, interpret, and explain statistical analyses appropriate to a particular research question
- 3. Interpret statistical findings into useable language
- 4. Demonstrate logical and progressive thought
- 6. Ability to collect and utilize quantitative data

Outcome 4: Analyze and assess human movement and health-related fitness in a variety of developmentally appropriate levels and contexts

- 1. Ability to understand and measure quantitatively the psychomotor developmental progression of humans
- 2. Ability to understand and measure qualitatively the psychomotor developmental progression of humans
- 3. Create developmentally appropriate physical activities
- 6. Ability to recognize developmental abnormalities
- 7. Recognize the characteristics of human movement and health-related fitness in special populations

Outcome 5: Understand and apply the mechanisms underlying behavior change

- 1. Knowledge and understanding of variables that influence behavior change

Outcome 6: Acquire skills to plan, implement, and evaluate effective exercise or health-related intervention programs

- 1. Recognize variables that impact movement
- 2. Ability to qualitatively measure variables that impact movement
- 3. Ability to quantitatively measure variables that impact movement
- 5. Understand cultural, lifespan, and special population issues relative to exercise programs
- 7. Ability to use universally accepted methods in the field

**Attendance**

Attendance is not required for the lecture portion of this course. However, classroom dynamics create fluctuations/modifications in the structure and timing of this course. Thus, attendance is paramount to meeting the course objectives. It is strongly suggested that you attend consistently to have success in this course.

Attendance for laboratory experiences are required. Laboratory experiences can not be recreated, thus attendance is vital to your learning. Any absences will be reflected in your grade.

**Course Prerequisites**

Required prerequisites to this course ES 224 (Research Methods and Data Interpretation)  
 A recommended prerequisite is *Human Physiology* (BIOL 325).

**Calculation of Grade**

Three factors are used to determine your overall percentage for the lecture portion of this course.

- |                        |   |  |
|------------------------|---|--|
| 1. Quizzes             | = | 50 pts (3 * 10 pts/each + 20pts on 4 <sup>th</sup> quiz) |
| 2. Exams               | = | 225 pts (3 * 75 pts/each)                                |
| 3. Clinical Vignettes  | = | 20 pts (2 * 10 pts/each)                                 |
| 4. Laboratory Writeups | = | 20 pts (4 * 5 pts/each)                                  |
| 5. Reading Reflection  | = | <u>25 pts (5 * 5 pts/each)</u>                           |
|                        |   | <b>340 pts.</b>  |

***Quizzes***

Four quizzes will be administered. One per unit, covering the first half of the information. These will contain multiple choice, true/false, short answers, essay, and/or diagramming questions. These will be timed for 10 minutes at the beginning of class. The 4<sup>th</sup> quiz is larger (20 pts), while 1<sup>st</sup> – 3<sup>rd</sup> are 10 points each.

***Exams***

There will be 3 unit exams during the semester. These exams will cover both lecture and text material. These exams may contain multiple choice, true/false, short answers, essay, and/or diagramming questions. You will be notified prior to the exam. If you are to be absent on the date an exam is scheduled, you may make up the exam provided you contact me **prior** to the date of the exam. Rescheduling will be at the convenience of the instructor. Failure to contact me **prior** to the exam date will result in you not being permitted to take a make up. However, understand that make-up exams will be different than the original exam and are often decidedly more difficult than regular exams.

***Clinical Vignettes***

One clinical vignette will be completed. See instructions on **page 5** of the syllabus.

***Laboratory Writeups***

Four laboratory experiments will be conducted. You will be required to write a lab report in response to each experience. The general format of this report is provided on **page 6** of the syllabus.

***Reading Reflections***

A set of clinically related reading assignments (5 total) will be given. You will be required to write a short reaction paper. Your written response can cover anything relevant to the reading. It might be an emotional reaction, a critique, an investigation of recent scientific literature, etc. I only require that it be written relative to the reading, with proper grammar and spelling. Each reflection can be 1/3 to 1 page, single spaced. Submitting all 5 reflections in one document is required.

All assignments turned in late will receive grade reductions. Each day that the assignment is late will result in a 5% reduction on that assignment. No assignments will be accepted following the completion of the last exam.

### ***Comprehensive Final***

The final exam is comprehensive, covering both lecture and text material presented throughout the semester. The format of this exam will be largely multiple choice and true/false, but may include short answer, essays, and diagramming. This exam will focus on *major* concepts presented in the course. This exam is optional.

### **Determination of Grades**

The grading scale for the lecture and lab portions of this course will be as follows:

<u>Percentage</u>
A = 90.00 or above
B = 80.00 to 89.99
C = 70.00 to 79.99
D = 60.00 to 69.99
F = 59.99 or below

### **Exam Coverages**

To be determined.

### **Statement of Academic Integrity**

You will be expected to act in accordance to the rules set forth in the Truman State University's Student Handbook. Academic dishonesty (e.g. cheating on an exam or using other's writings) will not be tolerated and the student "will be subject to disciplinary action, including suspension or expulsion from class, the student's academic program, or the University." Online courses are highly susceptible to cheating. The online quizzes should be completed alone on an adequate computer system (i.e. reasonably new computer with a secure, cable-connected high speed internet and the recommended browser edition for Blackboard).

### **Disclaimer**

The structure of this course is subject to change. This flexibility is for the benefit of the entire class, not for individual students. The number and content of exams and/or assignments may be adjusted to fit the needs of the class at that time. Fairness will always be exercised.

*"The man who acquires the ability to take full possession of his own mind may take possession of anything else to which he is justly entitled."* Andrew Carnegie

## Clinical Vignettes in Neuroscience

Using your assigned topic number, open the appropriate .pdf file from Blackboard – “Course Documents”

For example: if you are number 31, open CV26-35.pdf  
scroll to #31 – Myotonic Dystrophy

Read your vignette, while referring to the abbreviations.pdf file to decipher the clinical nomenclature. Gain a basic understanding of the clinical issue.

The overall goal of this assignment is to **force you to associate basic neurophysiological and/or neuroanatomical information to a behavioral neurological disorder in order to better comprehend the complexity and dynamics of these systems.**

Each topic is different and will warrant its own unique approach. However, each approach will contain the same basic features:

1. introduction paragraph / slide stating the basics about the clinical problem
2. most of the bulk of the paper / powerpoint should link information that we have learned or are learning to the clinical problem (e.g. how myelination of neurons is impacting this issue or the disorder is impacting a particular pontine nucleus). I am wanting you to inform me about how this disorder is affecting the neuroanatomy/physiology and/or vice versa.
3. at least one research article addressing this clinical problem (e.g. treatment of, diagnosis of, etc.) (must be from 2000 A.D. or more recent)
4. any pertinent images which would aid in the understanding of the disorder.

You may choose to present this in a paper format or in a PowerPoint format. If you choose to do a PowerPoint, realize that I do want written information included, which would likely be included in the “speaker notes” section of the program.

Include a reference section.

## Lab Report Instructions

You will be required to complete five laboratory experiences. Some of these experiences will be conducted online, while others will be performed in the laboratory. Then you will write a lab report using the following criteria. A concise report in **one page is preferred**, but no more than 2 pages is allowed. Most attention should be given to the **Methods** and **Discussion** sections.

1. **Title:** It should be **brief** (aim for ten words or less) and describe the main point of the experiment or investigation. An example of a title would be: "Effects of Fatigue on Fine Motor Control". Do not use a title page.
2. **Introduction / Purpose:** Write a **brief** paragraph (3-5 sentences) that explains the objectives or **purpose** of the lab. An introduction may contain background information and a statement regarding a **hypothesis**.
3. **METHODS:** Describe the steps you completed during your investigation. This is your **procedure**. Be sufficiently detailed that anyone could read this section and duplicate your experiment. When using a website, your methods should include the URL address of website used to conduct the experiment. If not conducted online, then include materials used. Write it as if you were giving direction for someone else to do the lab. It may be helpful to provide a Figure to diagram your experimental setup.
4. **Results/Data:** Numerical data obtained from your procedure usually is presented as a **table or graph**. Data encompasses what you recorded when you conducted the experiment. It's just the facts, not any interpretation of what they mean. No text is required for this section.
5. **DISCUSSION/Conclusions:** This section contains any calculations you made based on the results. This is where you interpret the data and determine whether or not a hypothesis was accepted. This is also where you would discuss any mistakes you might have made while conducting the investigation.
6. **Figures & Graphs:** Graphs and figures must both be labeled with a descriptive title. Label the axes on a graph, being sure to include units of measurement. The independent variable is on the X-axis. The dependent variable (the one you are measuring) is on the Y-axis. Be sure to refer to figures and graphs in the text of your report. The first figure is Figure 1, the second figure is Figure 2, etc.
7. **References:** If your research was based on someone else's work or if you cited facts that require documentation, then you should list these references.