

**Instructor:** Devin Jindrich  
**Office:** UH 310  
**Office Hours:** Tuesdays 2:00–3:00  
and by appointment

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4 Credit Hours

**“Information is not knowledge” - Albert Einstein**

### **COURSE DESCRIPTION**

Learning principles of motor control and skill acquisition, with an emphasis on the relevance to rehabilitation, human factors, physical education and performance. Specific topics include: 1) The properties of moving (dynamical) segmented systems and some of the challenges of motor control; 2) Physiological properties of the musculoskeletal system that relate to movement control; 3) Basic control systems theory and vocabulary; 4) Organization of the nervous system from the motor unit to the brain; 5) Capabilities and limitations of neural compensations for controlling movement; 6) The interactions between neural and musculoskeletal systems that underlie movement; 7) The development of motor function in infancy and childhood; 8) Neurophysiological principles of learning; 9) Principles of effective learning at the behavioral level; 10) Principles for maximizing performance as applied to athletics and rehabilitation. **PREREQUISITES:** BIOL 177, 178, KINE 202

### **CONTENT LEARNING OUTCOMES**

The overall objective of KINE 301 is to understand how humans make effective movements. Understanding involves thinking about what the *requirements* for making movements are and what makes movement inherently difficult. Even simple movements that we take for granted are complex at many levels! From the physics of segmented systems themselves, to the many muscles involved in most movements, to the physiological properties of muscle and the nervous system that both enable and constrain movement. KINE 301 is about understanding how the nervous system works with the musculoskeletal system to overcome complexity and achieve high performance. Understanding the dynamic neuro-musculo-skeletal interactions that result in effective movement involves learning a bit about how neurons work, how the spinal cord and brain function, and some ideas about how movements may be planned and executed. However, because we learn to do so many movements, we need also to think about the process of learning – where learning happens and how.

There are clearly many factors that affect motor control! An added challenge is to appreciate the interconnections among many factors that influence motor control (mechanical, musculoskeletal, neural, psychological, developmental, etc.). Completing KINE 301 involves being able to:

1. Apply basic principles of segmental mechanics to understanding movement
2. Explain how the brain, spinal cord, and musculoskeletal systems interact to plan and execute movement using concepts from control systems theory, dynamical systems theory, neuroanatomy, neurophysiology, and psychology
3. Evaluate factors that limit or constrain motor performance, including muscle- and neuro-physiological properties, and cognitive information processing
4. Use research findings about motor learning to generate strategies to improve motor performance, including structuring practice, providing feedback, and adapting training to skill level

### **SKILL LEARNING OUTCOMES**

Another objective of KINE 301 is to become more **skilled** in scientific reasoning and quantitative measurement, analysis, and evaluation. Completing KINE 301 involves being able to:

1. Apply principles of effective learning to improving study strategies
2. Apply principles and knowledge of motor control to specific movement contexts
3. Effectively read, understand, analyze, and evaluate scientific literature
4. Generate motor control hypotheses that are novel, important, reasonable and testable
5. Use data acquisition tools to quantitatively measure human movement
6. Use data and basic statistics to evaluate motor control hypotheses
7. Identify sources of uncertainty and use them to weigh evidence
8. Construct arguments to defend hypotheses, experimental methods, and data-based conclusions
9. Report scientific findings using clear, well-organized written and oral presentation

A key theme for the course is synthesizing **FRAMEWORKS** (conceptual structures that organize and connect ideas and/or facts) to help analyze problems and evaluate solutions. We will use scientific writing as a tool to illustrate how frameworks can be useful for analytical thinking.

### **LECTURES AND QUIZZES**

The primary content for this course will be available through reading (primary literature), and in-class discussions. Online lectures and textbooks will be used as resources to find information necessary for in-class activities and discussions, or provide opportunities for review. The texts (below) are listed for reference only (you will not be responsible for information in a textbook that is not covered elsewhere in class). Each section of the course will address one or more of the questions, as listed in the schedule below.

**PROBLEM SOLVING AND QUESTIONS**

Problem solving is a part of KINE 301. You will not be provided with step-by-step instructions on how to complete assignments. Instead, one objective of the course is to help you develop a toolbox of understanding and skills that will help to solve scientific problems. Some of the responsibility for figuring out how to use the tools to solve problems will be yours. Therefore, an expectation of this course is that students ask questions when they don't understand something, or need help solving problems. I will provide many opportunities to ask questions: in class, in labs, in office hours, through email, etc. I encourage and invite questions. However, it is up to you to develop and ask them.

**REFERENCE TEXTS (entirely optional)**

Schmidt, R. A. & Wrisberg (2008). *Motor Learning and Performance: A Situation-based Learning Approach* (4th Edition). Human Kinetics Publishers Ltd. (ISBN-13: 9780736069649)

Schmidt, R. A. & Lee, T.D. (2011). *Motor Control and Learning: A Behavioral Emphasis* (5th Edition). Human Kinetics Publishers Ltd., Champaign, IL. (ISBN: 0-7360-4258-1)

Latash, M.L. (2008). *Neurophysiological Basis of Movement*, 2nd ed. Human Kinetics: Champaign, IL.

Kandel, E.R., Schwartz, J.H., Jessell, T.M. (2000). *Principles of Neural Science* 4th ed. McGraw-Hill Medical: New York, NY.

**WEBSITE**

Assignments, handouts, online lectures and notes, quizzes, instructor correspondence, grades, etc. will be available through the course website. In addition, we will use the online resource [Reasoned Writing / A Framework for Scientific Papers](https://reasonedwriting.moodlecloud.com/) (<https://reasonedwriting.moodlecloud.com/>). A more mobile-friendly version of the [Reasoned Writing](http://www.reasonedwriting.com/) site is available at <http://www.reasonedwriting.com/>. If you need help with web access or computer use or have any unique needs, please contact the instructor.

**EMAIL**

I always make an effort to respond to emails as promptly and thoroughly as possible. To facilitate this it is important for me to be able to easily identify class emails. Consequently, I request that any emails that you send me about the course begin with "KINE301:" in the subject line. For example, a subject could read "KINE301: Appointment Request." I cannot guarantee responses to emails that do not have "KINE301:" in the subject. In the case that I am slow to respond to an email, please feel free to simply re-send the message. My inbox gets out of control sometimes, and emails can get lost or mis-filed, and I appreciate the reminder if I have somehow misplaced a message or failed to respond for any other reason.

**SCHEDULES**

The schedules and assignments contained in this syllabus may be subject to change. It is up to you to make sure that you are aware of all announcements concerning changes in the course outline, readings, assignments, exams, and other matters made during class periods whether or not you are in attendance when announcements are made. Some assignments for each class are listed below. Preparing before class is likely to lead to more interesting class time and also facilitate studying.

**ATTENDANCE**

Regular attendance is essential. Many missed assignments, including quizzes or lab activities, CANNOT be made up, except in the case of university business or religious holiday. Accepting late assignments is not fair to other students for several reasons. For example, late assignments interfere with our ability to discuss assignments during class periods.

**CLASSROOM COURTESY**

Please follow these guidelines for common courtesy:

- Respect individual diversity of each person in the class.
- Turn Cell Phones off before class, do not text message.
- Do not listen to a device during class time, including keeping the ear piece in your ear.
- Use computers in class only for class activity. Attempts to multitask (i.e. texting, etc.) will decrease performance

**ACCOMODATIONS FOR DISABILITIES**

We will make any reasonable accommodations for limitations due to any disability including learning disabilities. Please arrange an appointment to see me to discuss any needs you might have. All discussions are confidential. Students with disabilities who require academic accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disabled Student Services (DSS). This office is located in Craven Hall 4300 and can be contacted by phone at (760) 750-4905, TDD (760) 750-4909 or by email at [dss@csusm.edu](mailto:dss@csusm.edu). Students authorized by DSS to receive accommodations should meet with me during my office hours, or in another private setting, in order to ensure your confidentiality. **Note:** Please inform me during the first week of classes about any disability or special needs that you have that may require specific arrangements related to attending the class sessions, carrying out class assignments, or writing papers or examinations.

**COLLABORATIVE WORK**

You will work in small groups to complete lab assignments, discuss assignments, and compile written and oral presentations. However, some assignments will be submitted individually. Collaborative work is an opportunity to learn from each other, divide labor on assignments, learn through teaching, meet others in the class and major, become accustomed to team-based work, etc. Therefore, collaborative work is an important part of the class and your grade will reflect your contribution to the success of your groups. Evidence of leadership, effort, organization, congeniality and flexibility will favorably reflect on your performance in the class. However, collaborative work is not meant to include sending emails to the entire class with answers to quizzes or tests, which is considered a violation of the honesty and integrity policies.

**WRITING**

The University has an "All-University Writing Requirement" that students write at least 2,500 words for a 3 or more unit course. The University requirement reflects the importance of writing for virtually every field of study. Therefore, we will emphasize writing (specifically scientific/technical writing), and assessments for most work will be written papers. Writing is an expression of the critical/analytical/hierarchical thinking that is a major objective of KINE 301.

**FORMATTING IS NOT WRITING.** You may have been told (repeatedly) that effective writing involves use APA or MLA style to format your references. In my opinion, the emphasis on APA reference formatting comes at great cost to actually learning how to write. I don't care in the slightest how your references are formatted, so long as the formatting is clear and complete (i.e. including complete references that I can cross-check). Margins, spacing, reference styles, etc. are matters of appearance and are NOT important.

What IS important is that you write using specific, concise, and clearly-written sentences. MOST important is that you structure your paragraphs and papers using REASONING (deductive and/or inductive): that you lead the reader to specific, clear conclusions using specific, clear evidence. Use APA reference formatting if you want – I don't care. So long as your papers are well-reasoned, I'm good.

**ASSIGNMENTS**

Assignments will assess comprehension of the important concepts presented in the course, and the ability to apply concepts to novel problems. The assignments dates are scheduled ahead of time for your convenience, therefore plan accordingly. A missed assignment can potentially be excused with a VALID AND WRITTEN EXCUSE FROM A REPUTABLE SOURCE. Otherwise, no points can be given for the assignment. Cheating will result in a failing grade for the course and possible referral to the university for disciplinary action.

**TIME EXPECTATIONS**

Completing a college courses is traditionally expected to involve 2-3 hours per week per credit hour of effort outside the course. Therefore, a reasonable expectation of this course would be that it will entail about 8-12 hours of effort outside of class time during the normal semester (multiply all these values by 2-3 times in summer, where time is compressed but content is unchanged). The effort required each week may vary, but on average the time might be expected to break down as shown in the table to the right.

ACTIVITY	TIME INVESTED
Reviewing lectures/reading	3-4 hours
Completing short assignments/quizzes	1 hour
Case Studies	3-4 hours
Lab Reports	3-4 hours

Organization is half the battle. In my experience, there is a high correlation between organization and success. Be sure not to fall behind on assignments. Having a weekly schedule, and adding class time into your schedule for each course (as you might for your work and other activities) can greatly improve performance and reduce stress. Completing an assignment early takes as much time as completing it at the last minute, but usually results in higher grades (particularly if you get feedback). I encourage you to work with friends and groups to discuss course material and complete assignments.

**CLASS PERIODS**

Most class periods will consist of class discussions, group work, and class presentations. If there are other things that you read about, hear about, know about, etc. that are relevant to the course, please do bring these up and discuss them! Class discussions are always welcome so long as they are focused and include everyone.

**OFFICE HOURS**

I encourage you to make use of office hours, or make appointments to come talk to me if you have questions or concerns. I have observed dramatic improvements in grades through one-on-one interaction. I also appreciate any and all feedback about the structure of the course, the material, ideas for making things better or clearer, etc. Feedback provided will not factor into grading decisions.

My office is in UH 310. If you arrive for an appointment and my door is closed, please knock. I keep the door open for all meetings with students, without exception.

**EXPECTATIONS OF THE INSTRUCTOR**

What is the instructor's job? To transfer information from their brain to the students'? To sort and rank students through grades? I would argue that these are not possible or desirable, respectively. Ideally, instructors have several responsibilities:

- 1) Instructors identify information and concepts about their course topics that are most important for understanding. Based on their knowledge and experience, instructors select relevant topics for study and reflection.
- 2) Instructors design activities that guide students through the process of discovery and learning, providing encouragement and constructive criticism, identifying important questions and encouraging students to become actively engaged in their own inquiry.

- 3) Instructors provide examples of the thinking process of their disciplines. Instructors demonstrate the creative process that leads to new ideas (e.g. testable models), and show examples of the evaluation and judgment that are used to come to conclusions.
- 4) Instructors assess the students in the course (i.e. grading). Instructors must determine the level of understanding required, design assessments for students to demonstrate understanding, and clearly communicate the instructor's expectations to students.
- 5) Instructors are responsible for maintaining academic standards and integrity. Instructors are responsible for ensuring that college-level coursework in each class is appropriate for the field, the class level, contributes to Department and University learning objectives, and is capable of having a long-term impact on students. Personally, I consider it an ethical imperative not to sell students short based on assumptions or potential misperceptions. I assume that ALL students are capable of HIGH QUALITY work on par with students anywhere. It is the instructor's job to try to find ways to help each individual achieve high performance, and help to motivate students to put in the time and effort necessary for excellence.

Finally, instructors have an added responsibility. Instructors have a responsibility not to spell everything out for the students. Although guidance, clarity, and communication may seem conducive to **knowledge** learning, excessive guidance can actually be detrimental for **skill** learning and higher-order understanding. Improving writing, or analysis, or evaluation skills requires attempting to perform assignments without complete guidance – in the presence of perceived uncertainty both in the desired outcome and the best path to reach the outcome. Skill learning depends on making mistakes: having expectations that are not completely structured and allow for errors, trial and correction, and, yes, even the potential for frustration sometimes.

### **SOME SUGGESTIONS FOR SUCCESS**

There is a lot that can be gained from KINE 301 (in my own humble opinion ;-). Getting the most out of the course is easiest if you are organized, not overly stressed out, and have enough time to reflect on some of the topics that we cover. Some suggestions:

- 1) Keep up-to-date on assignments and even get ahead a little. Just like setting your clocks faster by a few minutes can sometimes help getting places on time... if you set personal deadlines ahead of class deadlines, things will seem much easier.
- 2) Keep a record of areas that are confusing and ask questions. Come to office hours.
- 3) Try to understand, not simply memorize, course material. Understanding means putting information in frameworks of other things that are already known, and thinking about connections among different course topics. Compare and contrast different topics from the course, etc.
- 4) Please Please Please don't be satisfied with poor performance! If a score does not reflect the effort made to learn the material, then come to office hours, consult peers, take action to improve! I am confident that everyone is capable of getting a top grade. Don't sell yourself short and settle for less!
- 5) Please give me feedback about aspects of the course that you are not satisfied with. I can't change everything this semester, but some things I can!

### **CLASSROOM HONESTY AND INTEGRITY**

Honesty and integrity are a reflection of your character. Therefore, cheating is considered a serious offense. Students will be expected to adhere to standards of academic honesty and integrity, as outlined in the Student Academic Honesty Policy. All written work and oral presentation assignments must be original work. All ideas/material that are derived from other sources must have appropriate references to the original sources. Any quoted material should give credit to the source and be punctuated with quotation marks.

Students are responsible for honest completion of their work including examinations. There will be no tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty, in accordance with the general rules and regulations of the university.

Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole. Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University.

Students are expected to conduct themselves in a manner appropriate for class and comply with the rules of student conduct. The rules of student conduct are included in the California Code of Regulations, Title 5, and beginning at Section 41301. A student who violates university policies or regulations is subject to disciplinary action, which can result in a warning, reprimand, probation, suspension, or expulsion. The Chancellor of the California State University specifies procedures under which the university may take disciplinary action against a student. These procedures are on file in the Office of the Dean of Students, Craven Hall, Room 5306.

**GRADING.**

I don't particularly like grading – but it has to be done. Ideally, grades are valid assessments of learning. Unfortunately, grades often assess only some aspects of learning and can be influenced by lots of other confounding factors 😊. My honest suggestion is to focus on really understanding the material well and don't worry about your grade except to the extent that grades or scores give you information that can help you learn and improve.

The course is NOT curved (it is criterion-referenced, not norm-referenced). If everyone gets an "A," then I'll be ecstatic.

Grading will involve a hybrid system intended to give you (the students) as much agency and control over your grade as possible, and to link grades directly to learning and improvement.

To PASS the course (i.e. grade of C or higher), involves "Good" performance on course assignments in **ALL** four areas of the course:

**ATTENDANCE, CASE STUDIES/LABORATORIES, GROUP CONTRIBUTION, and QUIZZES&EXAM.** The criteria for "Good" performance are:

**ATTENDANCE** will be measured in laboratory sections. "Good" performance means fully attending (in both the presence and attention sense) at least 11 of the 15 (75%) laboratory sessions.

**CASE STUDIES and LABORATORIES** will be assessed through written assignments. Written assignments involve outlines and write-ups (and literature grids, for case studies). Assignments will be evaluated as either "Revise," "Good," "Super," or "Exceptional," and returned with comments and feedback. With the exception of the final two assignments, assignments with a "Revise" evaluation can be revised and re-submitted at most TWO times to achieve a "Good," "Super," or "Exceptional," designation. Although all students in a group are expected to contribute to the first submission of an assignment, revisions are **opt-out**. Although all group members have the opportunity to participate in revisions, only group members that wish to participate in a revision need participate.

Outlines must receive a "Good" designation before write-ups can be submitted. Achieving "Good" or better performance on 4 of 6 laboratories and/or case studies will be considered passing performance.

**GROUP CONTRIBUTION** will be assessed through instructor observations and peer evaluations. "Good" performance means demonstrated, active contribution to group projects that, in turn, receive "good" or better evaluations.

**QUIZZES AND EXAM** will assess understanding of fundamental course concepts and understanding of class reading. "Good" or passing performance involves receiving over 70% of the total points available for quizzes and exams, or by receiving over 60% of the points available for quizzes and over 60% of the points available on the exam.

**CRITERIA FOR HIGHER GRADES.** Students can achieve higher-than-passing grades by demonstrating exceptional performance ("Super" or "Exceptional" evaluations) on submitted assignments, submitting more assignments, or both. Two write-ups with "Good" evaluations can count for one write-up with "Super" evaluation. Two "Super" write-ups can count for one "Exceptional" evaluation.

**CRITERIA for "B" GRADES:** Attendance and participation exceeds passing performance (attending at least 12 labs). At least 4 laboratories and/or case studies with "Super" evaluation or better. Over 75% of the total points available for quizzes and exams (or over 70% of the points available for quizzes and over 70% of the points available on the exam).

**CRITERIA for "A" GRADES:** Excellent attendance (attending at least 13 labs). All laboratories and case studies completed. At least 4 laboratories and case studies with "Super" evaluation or higher, and at least 2 laboratories and/or case studies with "Excellent" evaluation. Over 80% of the total points available for quizzes and exams (or over 75% of the points available for quizzes and over 75% of the points available on the exam). Demonstrated leadership role in group work.

Overall, grades are intended to reflect active engagement with course material, demonstrated learning that results in high performance, patience and problem solving, and responsibility/leadership.



## CLASS SCHEDULE

\*Subject to change at any time\*

Classes are TR 9:00-10:15 AM, Academic Hall 317

DATE/SECTION	DUE / TOPICS	QUESTIONS	REFERENCE READING / ASSIGNMENTS
<b>INTRODUCTION AND SCIENCE SKILLS TUTORIAL</b>			
<b>21 JANUARY</b> <i>Course Introduction</i>	-Logistics -Expectations and Potential	Who is this person? What is motor control? What is this class all about? What are the main questions that YOU have about motor control?	- Read this syllabus carefully
<b>23 JANUARY</b> <i>Pedagogy/Andragogy</i>	-Learning objectives of college classes	1. What is Bloom's Taxonomy & how can it help to think about learning? 2. What exactly do we mean by "critical thinking?"	- Required reading: <a href="#">Mayer (2002)</a> , <a href="#">NRC Report</a>
<b>CASE STUDY 1: STRUCTURING PRACTICE</b>			
<b>28 JANUARY</b> <i>Metacognition</i>	-Frameworks -Metacognition	3. What principles contribute to effective learning? 4. Can learning science contribute to <u>your</u> approach to school&career?	- Reference online lectures: <b>Assessment, Practice, Feedback, Learning</b>
<b>30 JANUARY</b> Assessment, Performance, and Learning	<b>QUIZ:</b> Mayer(2002), NRC Report -Different types of assessment -Performance curves	5. What is "performance" and how can we measure it? 6. How do we assess performance and learning? 7. Do changes in performance mean that learning has occurred? 8. Does increased performance during practice directly correspond to increased learning?	- Required reading: <a href="#">Shea and Morgan (1979)</a>
<b>04 FEBRUARY</b>	<b>CASE STUDY 1 INTRODUCTION</b>	9. How can we design practice and feedback schedules to maximize learning for individuals or groups?	
<b>06 FEBRUARY</b> Practice Schedules	<b>QUIZ:</b> Shea and Morgan (1979) -Structuring learning -Practice Schedules -Contextual interference	10. How can practice be structured to maximize learning for different people?	- Reading: <a href="#">Winstein and Schmidt (1990)</a>
<b>11 FEBRUARY</b> Feedback	-Intrinsic and Extrinsic -Augmented Feedback	11. What types of feedback are available to learners, and how can feedback be augmented? 12. How do you typically give or receive feedback? 13. Does providing more feedback during practice increase performance and learning?	- Reference online lectures: <b>Feedback</b>
<b>13 FEBRUARY</b> Desirable Difficulties	<b>QUIZ:</b> Winstein & Schmidt (1990) -Feedback schedules -Desirable Difficulties	14. Does the type and amount of feedback provided during practice affect performance and learning? 15. Does making mistakes help or hinder learning? 16. How would you design a feedback schedule to maximize learning?	- Reading: <a href="#">Gisquet-Verrier, 2018</a>
<b>18 FEBRUARY</b> Learning and Memory	- Learning	17. How do we define learning and classify different types of learning at the behavioral level? 18. How does learning occur at the cellular level?	- Reference online lectures: <b>Learning and memory</b>
<b>20 FEBRUARY</b> Learning and Memory	<b>DUE:</b> Case Study 1 Literature Grids <b>QUIZ:</b> Gisquet-Verrier, 2018 - Long-term memory	19. What is a FRAMEWORK to structure library research? 20. Can learning occur in muscles or in the spinal cord? 21. Are long-term memories fixed? 22. Does learning different types of information involve different brain areas?	- Reading: <a href="#">Goodstein: "How Science Works"</a> <a href="#">Platt (1964)</a>

<b>25 FEBRUARY</b> Scientific Method	<b>-Scientific Approaches</b>	23. How can we deductively reject and support hypotheses?	
<b>27 FEBRUARY</b> Scientific Method	<b>QUIZ:</b> Goodstein, Platt (1964) <b>-Deductive frameworks</b>	24. How can “strong inference” lead to better scientific models?	<b>- Required reading:</b> <a href="#">Fedak et al., (2015)</a>
<b>03 MARCH</b> CASE STUDY 1	<b>DUE:</b> Case Study 1 reasoned outlines	25. How can we use the FRAMEWORK of a logical outline to structure problem solving and written presentation?	<b>- Required reading:</b> <a href="#">A Framework for Scientific Papers Section 2</a> (Introduction and Methods)
<b>05 MARCH</b> Scientific Method	<b>QUIZ:</b> Fedak et al. (2015) <b>- Inductive frameworks</b>	26. How can inductive frameworks lead to better scientific models? 27. How do <u>you</u> use induction to gain knowledge and understanding?	- Work on Case Study 1 outline
<b>10 MARCH</b> Scientific Writing	<b>- Writing the Introduction and Methods</b>	28. How can we write to defend reasoned conclusions in science?	- Work on Case Study 1 written manuscripts
<b>12 MARCH</b> Scientific Writing	<b>QUIZ:</b> AFSP Sec 2 (Introduction and Methods)	29. How can we use reasoning frameworks to help structure the Introduction section of a paper? 30. How can we use reasoning frameworks to structure the Methods section of a scientific paper?	- Work on Case Study 1 written manuscripts
<b>CASE STUDY 2: SEGMENTED SYSTEMS</b>			
<b>17 MARCH</b> INTRODUCTION TO CASE STUDY 2	<b>DUE:</b> Case Study 1 written manuscripts <b>-Segmented Systems</b> <b>-Chaos</b>	31. How do you control your body and limbs during movement? 32. Are segmented systems like arms, legs, and bodies relatively easy to control, or are they complex? 33. Is neural feedback necessary for controlling complex aspects of movement such as stability?	<b>- Reading:</b> <a href="#">Turvey (1990)</a>
<b>19 MARCH</b> INTRODUCTION TO CASE STUDY 2	<b>-Arm Movements</b> <b>-Interaction torques</b>	34. How do the intrinsic dynamics of musculoskeletal systems influence motor performance? 35. Are there motor tasks that are important to you that are influenced by intrinsic dynamics?	<b>- Reference online lectures:</b> <b>Segmented Systems, Intrinsic Dynamics, Muscles</b>
<b>24 MARCH</b> CASE STUDY 2: SEGMENTED SYSTEMS	<b>QUIZ:</b> Turvey (1990) <b>DUE:</b> Case Study 2 Literature Grids	36. If we know the forces in all the muscles crossing a joint, do we know how a joint will move? 37. How can “inertial coupling” affect movements that you make and train others to make?	<b>- Reading:</b> <a href="#">Marconi and Almeida (2008)</a> <a href="#">Dounskaia (2010)</a>
<b>26 MARCH</b> CASE STUDY 2	<b>EXAM: SCIENCE, STATISTICS, LOGIC, AND REASONED WRITING</b>		- Work on Case Study 2 Outline
<b>30 MARCH, 03 APRIL</b>	<b>SPRING BREAK</b>		
<b>07 APRIL</b> CASE STUDY 2	<b>Welcome back.</b>		- Work on Case Study 2 reasoned outlines
<b>09 APRIL</b> CASE STUDY 2	<b>QUIZ:</b> Marconi and Almeida (2008), Dounskaia (2010)	38. How do intrinsic musculoskeletal dynamics contribute to learning and performing skilled movements?	- Work on Case Study 2 reasoned outlines
<b>14 APRIL</b> CASE STUDY 2	<b>DUE:</b> Case Study 2 reasoned outlines		- Work on Case Study 2 written manuscripts
<b>16 APRIL</b> CASE STUDY 2			- Work on Case Study 2 written manuscripts
<b>CASE STUDY 3: BRAIN-CONTROLLED NEUROPROSTHESES</b>			
<b>21 APRIL</b> INTRO TO CASE STUDY 3	<b>DUE:</b> Case Study 2 written manuscripts <b>-Open Loop control</b>	39. What is “open-loop” and “closed-loop” control and why do time delays matter? 40. What are time delays associated with motor tasks that you do?	<b>- Reading:</b> <a href="#">Anderson (2004)</a> <a href="#">Lebedev and Nicolelis (2017)</a>

<b>23 APRIL</b> INTRODUCTION TO CASE STUDY 3	<b>-Neuroanatomy</b> <b>-Pathways, Relays</b>	41. How are neurons organized in the spinal cord? 42. Is the spinal cord mostly a conduit of information from the brain to the muscles, or is it capable of computations on its own? 43. What opportunities do the capabilities of the spinal cord provide for training and rehabilitation?	<b>- Reference online lectures: Nervous System, Spinal Cord, Brain, Learning</b>
<b>28 APRIL</b> CASE STUDY 3: BRAIN- CONTROLLED NEUROPROSTHESES	<b>QUIZ:</b> Anderson (2004) Lebedev and Nicolelis (2017)	44. What brain regions are associated with motor control and what are their functions?	- Work on Case Study 3
<b>30 APRIL</b> CASE STUDY 3	<b>-Functional principles</b>	45. Are there some common principles that can describe how brain regions communicate with each other, the spinal cord, and periphery?	- Work on Case Study 3
<b>05 MAY</b> CASE STUDY 3	<b>-Serial and Parallel processing</b>	46. How does information flow in the brain to make movements?	- Work on Case Study 3
<b>07 MAY</b> CASE STUDY 3			- Work on Case Study 3
<b>14 MAY</b> 7:00 – 9:00 AM	<b>No Final Exam – Work on Case Studies and Labs</b>		
<b>17 MAY</b> 11:59 PM	<b>FINAL PAPERS AND LABS DUE</b>		



## KINE 301: Motor Control and Learning

California State University San Marcos

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### LABORATORY GUIDELINES

**“Education is the path from cocky ignorance to miserable uncertainty.” -- Mark Twain**

Laboratories will consist of designing hypothesis-based studies to test questions in motor control. The objective of the laboratory is to gain reasoning skills and learn about how to design and conduct experiments in motor control (not to learn how to use fancy equipment). Lab activities will typically involve (1) a short review of the problems and relevant literature highlighting a gap in our knowledge of a particular problem; (2) generating both GENERAL and MEASURABLE hypotheses (3) designing an experiment that will allow for controlled, quantitative measurements; (4) collecting data using laboratory equipment and techniques; (5) analyzing the collected data to test the measurable hypothesis; and (6) discussion of the implications of the outcomes of the experiment on the general hypothesis, potential limitations that could have affected the results, and potential alternative interpretations. Specific guidelines for effective scientific writing and presentation will be an important component of the laboratory.

#### Requirements for Lab

- Attendance and participation are mandatory, except for health reasons at the discretion of the instructor. Laboratory activities may be moved to the lecture time of the course. The instructor will take Roll at the beginning of lab. Being late for lab will also result in forfeiture of participation points.
- No food allowed in the laboratory.
- Proper attire, including closed-toed shoes is required.
- Laboratory write-ups are due on the dates specified on Cougar Courses.
- You must bring a thumb drive or equivalent to store your personal data for analysis.
- Leaving without completion of the in-class portion of your lab will be considered an absence.

#### Recommendations for Lab

- Computers will be available for data analysis in the Motor Control Lab. There will be up to 20 students in each lab section. You may choose to bring your own laptop computer for data analysis.
- On some lab days, we will only have one data collection system and 20 students. You will have down time. A productive student might choose to use this down time to work on their homework assignments and/or discuss them with other students.

#### Safety

- Your safety is the highest priority. If for any reason you don't feel comfortable participating in any laboratory activity, please speak with your instructor.

#### Lab Assignments

Laboratory assignments will be made available for download from Cougar Courses. Assignments will contain three parts: **preparation, lab activities, and assignments**. You will be expected to arrive prepared by having completed pre-laboratory assignments (online material, readings, etc.). During the lab activity section, you must complete the lab activity before you leave for the day. You may choose to work on the analysis section of your laboratory assignment at home or in the computer lab if you prefer. However, it is recommended that you make use of your instructor's assistance in completing the lab requirements. Your lab assignment will be due as indicated (typically the next time that your lab section meets). *Laboratory papers that are not typed will not be accepted.* Many lab sections involve acquiring or reinforcing specific **skills**. Although you will work in groups, it is important to make sure that you are competent with each required skill, because each skill will be required for future labs.

#### PAPER SUBMISSION

Laboratory handouts will be collected at the end of each laboratory period. Written papers will be submitted through **Turnitin**. Please include your name within any document that you submit.

#### PLAGIARISM

“Plagiarism” can be defined as using another's words, ideas, materials or work without properly acknowledging and documenting the source. In practice, copying and pasting material from another source into your document constitutes plagiarism **UNLESS** you enclose the material in quotes and clearly identify the source with a reference. Students are responsible for knowing the rules governing the use of another's work or materials and for acknowledging and documenting the source appropriately.

**LABORATORY SCHEDULE**  
 \*Subject to change at any time\*  
 Classes are T or R 10:20-12:50 PM, University Hall 240

WEEK	DATES	TOPIC/PREPARATION	LAB ACTIVITY	SKILL EXPECTATIONS	ASSIGNMENTS
<b>LAB 1 Reasoning about Proprioception</b>					
1	21/23 JANUARY	- Introduction to the Lab	- <b>Mini-Lecture:</b> Proprioception - Proprioception Lab	- Data collection with force platforms - Basic data analysis using spreadsheets.	Read this syllabus and ask any questions you may have <a href="#">Reasoned Writing Section 1</a> (Frameworks) <b>Reading:</b> <a href="#">Polonyova and Hlavacka (2001)</a>
2	28/30 JANUARY	<b>QUIZ:</b> Reasoned Writing Section 1  <b>QUIZ:</b> Polonyova and Hlavacka (2001)	- <b>Mini-Lecture:</b> Descriptive and parametric statistics in spreadsheets - Frameworks and reasoning discussion and group activity - Proprioception data collection and analysis	- Understanding the calculations for measures such as variance and coefficient of determination - Understanding the assumptions of common statistical tests - Using data as premises of reasoned arguments - Using transitions to link premises - Supporting conclusions	<a href="#">Reasoned Writing Sections 2 and 3</a> (Reasoning and Logic)  Extra Credit: "The Man Who Lost His Body" (movie)
3	04/06 FEBRUARY	<b>QUIZ:</b> Reasoned Writing Sections 2 and 3	- The logic of scientific papers discussion and group activity - Proprioception data analysis, figures, and outline	- Basics of Logic - Logical Fallacies - Hierarchies and Trees - Ability to write well-structured, logical paragraphs	<b>Reading:</b> <a href="#">A Framework for Scientific Papers Section 1</a> (Hypotheses) <a href="#">Damiano et al. (2002)</a>
<b>LAB 2 – Manual Muscle Testing (MMT)</b>					
4	11/13 FEBRUARY	<b>QUIZ:</b> AFSP Section 1, Damiano et al. (2002)	- Discussion of Damiano et al. (2002) What is science? What isn't science? What are Hypotheses? Hypotheses as explanations vs. predictions. - MMT experiment design	- Critical analysis of scientific papers and hypotheses - Ability to write clear, specific sentences	<a href="#">Reasoned Writing Section 4</a> (Simplicity)
5	18/20 FEBRUARY	<b>DUE:</b> Proprioception Lab reasoned outline and figures <b>QUIZ:</b> Reasoned Writing Section 4	- <b>Mini-Lecture:</b> Correlation - MMT data collection and analysis - Writing simply group activity	-- Basic computer Data Acquisition - Upper-extremity EMG measurements	<a href="#">Reasoned Writing Section 5</a> (Specificity)
6	25/27 FEBRUARY	<b>QUIZ:</b> Reasoned Writing Section 5	- MMT data analysis, logic, and figures	- Data normalization - Using correlations to test measurable hypotheses - Ability to identify and correct common stylistic problems that interfere with clear writing	MMT Lab reasoned outline and figures
<b>LAB 3 – Intrinsic Dynamics and Compensations</b>					
7	03/05 MARCH	<b>DUE:</b> MMT Lab reasoned outline and figures	- <b>Mini-Lecture:</b> Intrinsic musculoskeletal dynamics	- Developing General Hypotheses - Developing Measurable Hypotheses	<b>Reading:</b> <a href="#">Holmes and Keir (2012)</a>

8	10/12 MARCH	QUIZ: Holmes and Keir (2012)	- Mini-Lecture: Compensations - Compensations experimental design and data collection	- Designing a controlled experiment - Careful and thorough data collection	Reading: <a href="#">Jindrich and Full (2002)</a>
9	17/19 MARCH	QUIZ: Jindrich and Full (2002)	- Compensations data collection		<a href="#">A Framework for Scientific Papers Section 3</a> (Results and Discussion)
10	24/26 MARCH	QUIZ: AFSP Section 3	- Compensations data analysis	- Data analysis and writing	Compensations reasoned outline
<b>SPRING BREAK</b>					
<b>LAB 4 – Independent Projects</b>					
11	07/09 APRIL	DUE: Compensations reasoned outline	- Experiment design	- Ability to write scientific papers using reasoning	
12	14/16 APRIL	DUE: Compensations written manuscript	- Experiment design	- Independently creating General and Measurable hypotheses	
13	21/23 APRIL	- Data collection	- Data collection	- Independently designing experiments to test hypotheses	
14	28/30 APRIL	- Data collection and analysis	- Data collection and analysis	- Using reasoning to test Measurable hypotheses	
15	05/07 MAY	- Data collection and analysis	- Data collection and analysis	- Using reasoning to test General hypotheses	
<b>No Final Exam – Work on Case Studies and Labs</b>					
	14 MAY 7:00 – 9:00 AM		<b>FINAL PAPERS AND LABS DUE</b>		
	18 MAY 11:59 PM				

“Producing thoughtful, talented graduates is not a matter of focusing on market-ready skills. It’s about giving students an opportunity that most of them will never have again in their lives: the chance for serious exploration of complicated intellectual problems, the gift of time in an institution where curiosity and discovery are the source of meaning. That’s how we produce the critical thinkers American employers want to hire. And there’s just no app for that.” – Molly Worthen

“Stay Hungry. Stay Foolish” – Stewart Brand