

# KINE 301: Motor Control and Learning

California State University San Marcos

Spring 2021

CRN: 22831

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**Student Hours:** Tuesdays 1:00–2:00  
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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

## WHO IS THIS CLASS FOR?

Before getting into all of the details, let's establish who this course is for. This course is for YOU, not for the me (the instructor). The purpose of KINE 301 is for you to LEARN, NOT to please an instructor and be judged with a grade.

## 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 and knowledge of motor control to specific movement contexts
2. Effectively read, understand, analyze, and evaluate scientific literature
3. Generate motor control hypotheses that are novel, important, reasonable and testable
4. Use data acquisition tools to quantitatively measure human movement
5. Use data, basic statistics, and reasoning to evaluate motor control hypotheses
6. Identify sources of uncertainty and use them to weigh evidence
7. Construct arguments to defend hypotheses, experimental methods, and data-based conclusions
8. Report scientific findings using clear, well-organized written and spoken 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 an important 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](http://www.reasonedwriting.com/), 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 courtesies:

- 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 spoken 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 or MLA 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 of effort outside the course per week per credit hour. 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, Zoom

DATE/SECTION	DUE / TOPICS	QUESTIONS	REFERENCE READING / ASSIGNMENTS
<b>INTRODUCTION</b>			
Course Introduction	-Background and logistics	Who is this person? What is motor control? What is this class all about?	- Read this syllabus carefully
26 JANUARY Course Introduction	-Expectations and Potential	What are the main questions that YOU have about motor control?	Reading: <a href="#">Reasoned Writing</a> Section 1 (Frameworks & Elements of Reasoning)
<b>CASE STUDY 1: SEGMENTED SYSTEMS</b>			
28 JANUARY	-Segmented Systems -Degrees of Freedom	1. Are segmented systems like arms, legs, and bodies relatively easy to control, or are they complex?	Reading: <a href="#">Reasoned Writing</a> Section 1 (Logical Transitions)
02 FEBRUARY	<u>QUIZ</u> : Reasoned Writing Sect. 1 -Dynamical Systems & Chaos	2. How do you control your body and limbs during movement?	Reading: <a href="#">Dounskaia (2010)</a>
04 FEBRUARY	<u>QUIZ</u> : RW Section 1 transitions -Interaction torques	3. Are there motor tasks that are important to you that are influenced by intrinsic dynamics?	
09 FEBRUARY	<u>QUIZ</u> : Dounskaia (2010) -Arm Movements	4. How can thinking about the elements of reasoning and logical transitions help us simplify writing?	Reading: <a href="#">Turvey (1990)</a>
11 FEBRUARY	<u>DUE</u> : CS 1 Literature Grids	5. How do the intrinsic dynamics of segmented systems influence motor performance?	
16 FEBRUARY	<u>QUIZ</u> : Turvey (1990) -Inertial Coupling	6. If we know the forces in all the muscles crossing a joint, do we know how a joint will move?	Reading: <a href="#">Marconi and Almeida (2008)</a>
18 FEBRUARY	<u>DUE</u> : Case Study 1 frameworks	7. How do the dynamics of segmented systems contribute to learning and performing skilled movements?	
23 FEBRUARY	<u>QUIZ</u> : Marconi & Almeida (2008)	8. How can we write effective Introduction and Methods sections of a scientific paper?	Reading: <a href="#">AFSP Section 2</a> (Introduction and Methods)
25 FEBRUARY	<u>DUE</u> : Case Study 1 outline drafts	9. How can we improve our reasoning and outlines?	
<b>CASE STUDY 2: SPINAL CORD AND BRAIN</b>			
02 MARCH	<u>QUIZ</u> : AFSP Sect. 2 -Spinal Neuroanatomy	10. How are neurons organized in the spinal cord?	
04 MARCH	<u>DUE</u> : Case Study 1 -Spinal Computation 1	11. Is the spinal cord mostly a conduit of information from the brain to the muscles, or is it capable of computations on its own?	
09 MARCH	<u>QUIZ</u> : Seg. Systems, Intrinsic Dynamics, Muscle Properties -Spinal Computation 2	12. What types of computations might occur in the spinal cord?	Reading: <a href="#">Bizzi et al. (1991)</a>
11 MARCH	-Spinal Learning	13. What opportunities do the capabilities of the spinal cord provide for training and rehabilitation?	
16 MARCH	<u>QUIZ</u> : Bizzi et al. (1991) -Brain Neuroanatomy	14. What brain regions are associated with motor control and what are their functions?	Reading: <a href="#">Lebedev and Nicolelis (2017)</a>
18 MARCH	<u>DUE</u> : Case Study 2 Lit. Grids -Brain Functional principles	15. Are there common principles that can describe how brain regions communicate with each other, the spinal cord, and periphery?	

23 MARCH, 25 MARCH		SPRING BREAK	
30 MARCH	<b>QUIZ:</b> Lebedev&Nicoletis (2017) <b>-Serial and Parallel processing (Pathways, Relays)</b>	16. How does information flow in the brain to make movements?	<b>Reading:</b> <a href="#">Eisdorfer et al. (2020)</a>
01 APRIL	<b>DUE:</b> Case Study 2 frameworks <b>-Learning</b>	17. How does learning occur at the cellular level?	
06 APRIL	<b>QUIZ:</b> Eisdorfer et al. (2020) <b>-Spinal and Neuromuscular learning</b>	18. Can learning occur in muscles or in the spinal cord?	
08 APRIL	<b>DUE:</b> Case Study 2 draft outlines <b>-Memory</b>	19. Are long-term memories fixed? 20.	
CASE STUDY 3: LEARNING, MEMORY, PRACTICE, FEEDBACK			
13 APRIL	<b>QUIZ:</b> Spinal Cord and Brain <b>-Memory and Learning</b>	21. Does learning different types of information involve different brain areas?	<b>Reading:</b> <a href="#">Gisquet-Verrier, 2018</a>
15 APRIL	<b>DUE:</b> Case Study 2 <b>-Types of assessment</b> <b>-Performance curves</b>	22. How do we define learning and classify different types of learning at the behavioral level? 23.	
20 APRIL	<b>QUIZ:</b> Gisquet-Verrier, 2018 <b>-Practice Schedules</b>	24. What is "performance" and how can we measure it? 25. How do we assess performance and learning? 26. Do changes in performance mean that learning has occurred?	<b>Reading:</b> <a href="#">Shea and Morgan (1979)</a>
22 APRIL	<b>-Contextual interference</b>	27. Does increased performance during practice directly correspond to increased learning? 28. How can we design practice and feedback schedules to maximize learning for individuals or groups?	
27 APRIL	<b>QUIZ:</b> Shea and Morgan (1979) <b>-Intrinsic and Extrinsic</b>	29. What types of feedback are available to learners?	<b>Reading:</b> <a href="#">Winstein and Schmidt (1990)</a>
29 APRIL	<b>DUE:</b> Case Study 3 lit grids <b>-Augmented Feedback</b>	30. How can feedback be augmented? 31. Does providing more feedback during practice increase performance and learning?	
04 MAY	<b>QUIZ:</b> Winstein & Schmidt (1990) <b>-Feedback type and amount</b>	32. Does the type and amount of feedback provided during practice affect performance and learning?	
06 MAY	<b>DUE:</b> Case Study 3 frameworks <b>-Feedback schedules</b>	33. How would you design a feedback schedule to maximize learning?	
11 MAY	<b>QUIZ:</b> Memory, Learning, Practice&Feedback Schedules <b>-Desirable Difficulties</b>	34. Does making mistakes help or hinder learning?	
13 MAY	<b>DUE:</b> Case Study 3 draft outlines <b>-Course Summary</b>	35. How does everything relate together?	
20 MAY 7:00 – 9:00 AM	No Final Exam – Work on Case Studies and Labs		
20 MAY 11:59 PM	CASE STUDY 3 DUE		

## 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 and online

WEEK	DATES	TOPIC/PREPARATION	LAB ACTIVITY	SKILL EXPECTATIONS	ASSIGNMENTS
<b>LAB BACKGROUND: Scientific and Statistical Methods</b>					
1	26/28 JANUARY	- Introduction to the Lab	- <b>Mini-Lecture:</b> A Scientific Method	Scientific Reasoning. General Hypotheses vs. Measurable Predictions.	Read this syllabus and ask any questions you may have <b>Reading:</b> <a href="#">A Framework for Scientific Papers Section 1</a> (Hypotheses)
2	02/04 FEBRUARY	<b>QUIZ:</b> AFSP Section 1	- <b>Mini-Lectures:</b> A Scientific Method Data analysis using spreadsheets.	Deductive and inductive reasoning. Testing Hypotheses. Data analysis with spreadsheets.	Spreadsheets worksheet <b>Reading:</b> <a href="#">Reasoned Writing</a> Sections 2 and 3 (Reasoning and Logic)
<b>LAB 1 – Segmented Systems</b>					
3	09/11 FEBRUARY	<b>DUE:</b> Spreadsheets worksheet <b>QUIZ:</b> RW Sects. 2 and 3	- <b>Mini-Lecture:</b> Statistics Review Segmented Systems Lab Introduction and Planning	Using frameworks and reasoning to make measurable predictions from general hypotheses	Experiment Design: segmented systems
4	16/18 FEBRUARY	<b>DUE:</b> Segmented Systems Experimental Design Presentation	- Experimental Design Presentations - Discussion and Revision		<b>Reading:</b> <a href="#">Reasoned Writing</a> Section 4 (Simplicity). <a href="#">Reasoned Writing</a> Section 5 (Specificity)
5	23/25 FEBRUARY	<b>QUIZ:</b> Reasoned Writing Sections 4 and 5	- Data collection and Analysis	Using spreadsheets to analyze data and perform statistics	<b>Reading:</b> <a href="#">A Framework for Scientific Papers</a> Section 3 (Results and Discussion)
6	02/04 MARCH	<b>QUIZ:</b> AFSP Results and Discussion	- Segmented Systems Lab Report	Analyzing and presenting experimental findings in a clearly-reasoned laboratory report	Segmented Systems Lab reasoned outline and figures
<b>LAB 2 – Intrinsic Dynamics and Compensations</b>					
7	09/11 MARCH	<b>DUE:</b> Segmented Systems 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	16/18 MARCH	<b>QUIZ:</b> Holmes and Keir (2012)	- <b>Mini-Lecture:</b> Compensations - Compensations experimental design and data collection	- Designing a controlled experiment	
	23/25 MARCH	<b>SPRING BREAK</b>			
9	30 MAR/01 APRIL	<b>QUIZ:</b> Intrinsic musculoskeletal Dynamics and Compensations	- Compensations data collection	- Careful and thorough data collection	<b>Reading:</b> <a href="#">Jindrich and Full (2002)</a>
10	06/08 APRIL	<b>QUIZ:</b> Jindrich and Full (2002)	- Compensations data analysis	- Data analysis	Compensations reasoned outline
11	13/15 APRIL	<b>DUE:</b> Int. Dyn./Compensations Lab reasoned outline draft	- <b>Mini-Lecture:</b> Information Processing	- Data analysis and writing	Compensations reasoned outline
<b>LAB 3 – Information processing (Psychological Refractory Period and Fitts' Law)</b>					
12	20/22 APRIL	<b>DUE:</b> Int. Dyn./Compensations Lab reasoned outline and figures	- <b>Mini-Lecture:</b> Hick's and Fitts' Laws - PRP and Fitts' Law Experimental	Using frameworks and reasoning to make measurable predictions from	

			Design	general hypotheses	
13	27/29 APRIL	<b>QUIZ:</b> Information processing in the Brain	- <b>Mini-Lecture:</b> Making Decisions - PRP and Fitts' Law Data Collection	- Careful and thorough data collection	<b>Reading:</b> TBD.
14	04/06 MAY	<b>QUIZ:</b> Making Decisions	- PRP and Fitts' Law Data Analysis	- Data analysis	
15	11/13 MAY	<b>DUE:</b> PRP and Fitts' Lab reasoned outline draft	- PRP and Fitts' Law Writing	- Data analysis and writing	
	20 MAY 11:59 PM	<b>DUE:</b> PRP and Fitts' Lab reasoned outlines and figures			

"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