COURSE DESCRIPTION: Physical therapy is a dynamic profession, one characterized by ongoing research to enhance clinical practice. As a future professional, it is imperative not only to seek and use appropriate information in improving clinical practice but also be contributors to existing knowledge. There are two components in this course. Both are related to your research project. The first is a written demonstration of understanding what research question is answered when a specific statistical test is applied. The other component is an extensive review of the literature. You started that process in Research 2. By the end of this course, you will be able to come up with an appropriate research design to investigate a clinical or research question and know what statistical test needs to be done to answer the question. You will also gain insights into the existing body of knowledge in your research project.

PREREQUISITES
Successful completion of Research 2.

COURSE COORDINATOR/INSTRUCTOR
Raymond Chong, Ph.D.
Office hours: Drop-in or by appointment

COURSE TIME/PLACE
Friday 1:00 – 2:00 PT classroom

COURSE OBJECTIVES
4.0 Professional Practice Expectation: Integrity
   4.1 Demonstrate integrity in all interactions with patients/clients, family members, caregivers, other health care providers, students, other consumers, and payers.
   4.1.1 Demonstrate professional demeanor both in and outside the classroom by following the program’s written guidelines for behavior and dress.
   4.1.2 Demonstrate awareness of issues related to subject protection, information confidentiality, and associated risks and benefits when conducting research.
   4.1.3 Identify vulnerable subject populations that require even greater protection when conducting research.

5.0 Professional Practice Expectation: Professional Duty
   5.1 Demonstrate professional behavior in all interactions with patients/clients, family members, caregivers, other health care providers, students, other consumers, and payers.
   5.1.1 Present self in a professional manner during all course interactions with faculty and peers.
   5.4 Effectively deal with positive and negative outcomes resulting from assessment activities.
   5.4.1 Accept constructive criticism.
5.4.2 Modify behavior appropriately in response to constructive feedback.
5.4.3 Develop plan of action in response to assessment activity results.

6.0 Professional Practice Expectation: Communication
6.1 Expressively and receptively communicate in a culturally competent manner with patients/clients, family members, caregivers, practitioners, interdisciplinary team members, consumers, payers, and policy makers.
   6.1.1 Work effectively and productively as a member of a professional work group.
   6.1.2 Use appropriate oral communication skills to facilitate classroom discussions pertaining to current topics related to physical therapy practice and other health care-related fields.
   6.1.3 Actively participate in classroom discussions and article critiques.

9.0 Professional Practice Expectation: Evidence-Based Practice
9.1 Consistently use information technology to access sources of information to support clinical decisions.
   9.1.1 Access electronic resources and incorporate related information into course learning activities.
9.2 Consistently and critically evaluate sources of information related to physical therapy practice, research, and education and apply knowledge from these sources in a scientific manner and to appropriate populations.
   9.2.1 Analyze and synthesize new information to enhance physical therapy practice.
   9.2.2 Evaluate and relate study outcomes/conclusions to physical therapy practice.
   9.2.3 Critically examine research design and methodology.
   9.2.4 Interpret results in relation to a study’s specific research hypotheses and methodology.
   9.2.5 Identify applications of faculty research to physical therapy practice.
9.2.6 Demonstrate the ability to evaluate evidence and determine its appropriateness in guiding physical therapy practice.

REQUIRED TEXTS

INSTRUCTIONAL STRATEGIES
The course is a combination of self-directed learning, group work and take-home assignments.

METHOD OF EVALUATION
This is a letter-graded course. Work with members of your research project on the assignments and submit each product as a group. Students working on case reports can pair up. All members of the group will receive the same score for each assignment. A member may be given a different score (better or worse) if his/her contribution is judged to be significantly different from the others. Each assignment must achieve at least the equivalent of a "B" grade. Failure to do so will result in an oral examination for the group. Each member of the group may also be tested individually.

COURSE SCHEDULE & DATES
- Jan 22 Practice case due by noon
- Feb 5 Case 1 due by noon
- Feb 19 Case 2 due by noon
- Mar 4 Case 3 due by noon
- Mar 18 Case 4 due by noon
● Mar 25 Draft of Literature Review due by noon
● Apr 1 Case 5 due by noon
● Apr 15 Literature Review due for grading by noon. Email the document to 1) your research advisor, 2) myself and 3) copy all members of the group. Insert the following two statements in your email (remove the quotes):

"1. I/We have followed the instructions on how to submit our work.
2. I/We verify that our research advisor has gone over the work that we are submitting."

ADA ACCOMMODATION
*Students with disabilities who believe they may need academic accommodations are encourage to speak with me after class and will need to contact Testing and Disability Services (TDS) (Galloway Hall; 706-737-1469; http://www.gru.edu/admin/tds/) as soon as possible for more information and/or to initiate the process for accessing academic accommodations.

*http://www.gru.edu/admin/tds/documents/testing_docs/facultyguide1.pdf (page 14)
Instructions for Research Design Assignments  
(50% of course grade)

General instructions
● For each task, refer to your notes and handouts in Research 1, recommended article(s) and the internet to guide your answers
● In each task, you are given the name of a statistical test
● Use your research project or topic to come up with a hypothetical study design which requires the use of the statistical test. You must think backwards, i.e., start with the statistical test that you are given and work back. Pretend that you are using the stated statistical test in your research study. Then come up with a research design that is appropriate for the statistical test. Do this with all the cases
● Cite your sources/references. There are several sources that you should cite including textbook (include the page or chapter) and class handouts from Research 1. Each case assignment has 1-2 articles that are recommended for you. You should go over them and cite them. You may even "copy" their design if you like. There is no limit to the number of resources that you should use. Use the APA citation or other journal style of your choice. Be consistent
● Save each work as a doc, docx or pdf document using the last and first names of the group members and the case number, for example: "ChongRaymondAkinwuntanAbiodunCooperMiriamBolglaLoriCase1". Email it to me on or before the stated deadline. Copy everyone in the group whenever you email me
● Where appropriate, use figures, flow charts, and tables to illustrate your answers
● Use the future tense in your answers
● You may consult with me when you work on the assignments. Do not consult your research advisor. They have no role in the assignments.

Practice Case. Deadline for submission: no later than January 22nd noon (no grade)
Name of statistical test: independent t-test
1. What research or clinical question is this statistical test intended to answer? Hint: Answer the question, then explain why one may choose to use the independent t-test as opposed to the paired t-test.
2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc); independent variable(s); age-group(s) of subjects, dependent variables (include the unit of measurement).
3. For each of the following concept, explain how they help the reader to interpret the results of your study: 1) standard deviation; 2) effect size; 3) p value; 4) type 1 error. You may include figures to explain your answers.

Use the following article as a resource:

CASE 1. Deadline for submission: no later than February 5th noon (10% of course grade)
Name of statistical test: receiver operating curve (ROC) analysis
1. What research or clinical question is this statistical test intended to answer?
2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc), grouping (within-subject, independent group or mixed design); independent variable(s); age-group(s) of subjects, dependent variable(s) (include the unit of measurement).
For each of the following concept, explain how they help the reader interpret the results of your study: 1) sensitivity, 2) specificity, 3) cut-off score, 4) true/false positive, or true/false negative, 5) likelihood ratio. You may include figures to explain your answers.

Use the following article as a resource:

**CASE 2. Deadline for submission:** no later than **February 19th noon** (10% of course grade)
Name of statistical test: 2 x 2 ANOVA (analysis of variance). Choose an independent, repeated, or mixed ANOVA design, i.e., 2 x 2 repeated ANOVA, 2 x 2 mixed ANOVA or 2 x 2 independent ANOVA design. Hint: You must explain your choice of ANOVA design. Keep in mind that the repeated design has more statistical power and therefore you should choose this option as the first choice (we discussed this in Research 1). If it is not appropriate for your hypothetical study, then consider the other options. However, do not simply pick the repeated design option just because it has more statistical power. There are justifiable instances where the mixed or independent designs are more appropriate instead. When you explain your choice, cite the textbook and the handouts from Research 1.
1. What research or clinical question is this statistical test intended to answer? Hint: Think about why we don't we do two 1-way ANOVAs instead, i.e., what can we learn from a 2-way ANOVA that we cannot from separate 1-way ANOVAs?
2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc), grouping (within-subject, independent group or mixed design); independent variable(s); age-group(s) of subjects, dependent variable(s) (include the unit of measurement).
3. For each of the following concept, explain how they help you to interpret the results of your study: 1) main effect, 2) interaction effect, 3) p value, 4) post-hoc test(s). You may include figures to explain your answers.

Use the following articles as resources:

**CASE 3. Deadline for submission:** no later than **March 4th noon** (10% of course grade)
Name of statistical test: multiple regression analysis
1. What research or clinical question is this statistical test intended to answer? Hint: Think about why we don't do separate simple (single) regression tests instead, i.e, what can we learn from doing a multiple regression test that we cannot with multiple simple regression tests?
2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc), grouping (within-subject, independent group or mixed design);
independent variable(s); age-group(s) of subjects, dependent variable(s) (include the unit of measurement). Hint: Come up with predictor (independent) variables that you think are not correlated with each other.

3. For each of the following concept, explain how they help the reader interpret the results of your study: 1) r, 2) \( r^2 \), 3) stepwise analysis (forward), 4) criterion variable, 5) predictor variable. You may include figures to explain your answers.

Use the following article as a resource:

**CASE 4. Deadline for submission:** no later than March 18th noon (10% of course grade)

Name of statistical test: factor analysis

1. What research or clinical question is this statistical test intended to answer? Hint: Explain the rationale of doing the factor analyses statistical test not in terms of the statistical purpose but the clinical application.

2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc), grouping (within-subject, independent group or mixed design); independent variable(s); age-group(s) of subjects, dependent variable(s) (include the unit of measurement). Hint: Come up with about 9-12 dependent variables divided into groups of 3 or 4. Within each group (i.e., factor), the variables should be highly correlated with each other but not with the variables in the other groups (factors). Go over the Chong resource article cited below and see what variables were used. Don't copy the variables blindly but use them to help you think about how to come up with highly correlated variables in your hypothetical study. After that, you need to label each factor that represents the theme of the variables in each factor. See how the Chong resource article label their factors. Illustrate your factors using a table. You should also refer to the Research 1 ppt handouts on Factor Analysis and follow the procedures.

3. For each of the following concept, explain how they help the reader interpret the results of your study: 1) factor loading, 2) explained variance, 3) Cronbach's alpha. You may include figures to explain your answers.

Use the following article as a resource:

**CASE 5. Deadline for submission:** no later than April 1st noon (10% of course grade)

Name of statistical test: reliability (Choose intra-rater, inter-rater, subject test-retest or instrument test-retest reliability)

1. What research or clinical question is this statistical test intended to answer?

2. Explain your research design. Include the following concepts where applicable: sampling method (purposive, random, etc), grouping (within-subject, independent group or mixed design); independent variable(s); age-group(s) of subjects, dependent variable(s) (include the unit of measurement), gold standard of comparison.

3. Explain how you will control for the other factors of reliability.

4. Explain how the ICC value helps the reader interpret the results of your study. You may include figures to explain your answer.
Hints:

<table>
<thead>
<tr>
<th>If you choose ...</th>
<th></th>
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| reliability of the rater/raters | ● You can't test/retest the raters if the equipment is automated/computerized unless the rater is involved in some way which causes the equipment to take bad readings (e.g. incorrect placement of a sensor on the subject's body).  
● Explain how subjects will produce a consistent performance across multiple tests. You can however, carry out a reliability of the rater/s if you are comparing for example, experienced versus inexperienced raters. Also, explain how the variance of the instrument/equipment and the subjects will not confound the study. |
| reliability of the subjects | ● Explain how the rater/s and the equipment will both be reliable so that the majority of the variance is primarily attributed to the subjects. |
| reliability of a test/equipment | ● Explain how the subjects' performances will be consistent and how the rater/s across multiple measurements will be reliable. |

► Make sure you’re not mixing two or three reliability tests in the same study, otherwise you can no longer tell where the source(s) of variance came from.

Use the following articles as resources:


How to do well in the case assignments

● Follow the "General instructions" section carefully
● Relate your answers to your hypothetical research topic. For example, when you explain the t-test, don’t stop there but relate it to your research topic. Do this for all the statistical concepts listed in Q1 and Q3 of each case assignment
Instructions for Literature Review Assignment
(50% of course grade)

General instructions

- Refer to the Literature Review section of the "Instructions for Written Report of Research Project" document here: http://www.augusta.edu/alliedhealth/pt/researchcourse/research3.php#
- Compile your work as one document (i.e., one document per group). Save it as a doc or docx. Include the cover page and the contents page. The templates are provided at the end of the Instructions document. Format these two pages exactly as indicated in the templates.
- Email a draft of your document to me on or before the stated deadline for general feedback.
- Email the final version of the document for grading to me and your research advisor on or before the stated deadline. Email the document to 1) your research advisor, 2) myself and 3) copy all members of the group. Insert the following two statements in your email (remove the quotes):

"1. I/We have followed the instructions on how to submit our work.
2. I/We verify that our research advisor has gone over the work that we are submitting."

How to write the literature review

The Instructions document provides a good amount of detail to guide your writing. Go through the document thoroughly. In general, there are two ways of writing a review. They can be appreciated by referring to two review articles that were distributed in Research 1.

The first review style can be seen in the paper by Woollacott & Shumway-Cook (2002, titled "Attention and the control of posture"). They not only summarized the body of knowledge but provided critiques throughout the paper as well. As you read the review article, you will see that in each section, the authors first described an article or two. Then they provided a critique of the researchers' work in order to draw their own conclusion or point out limitations of the study.

The second way to write a review article can be found in the article "Gait training strategies … " by Eng & Tang (2007) in which they incorporated several matrices, one for each sub-section of their paper, similar to the matrix that you submitted in Research 2. In such a review format, the matrix, since it is supposed to be a good summary of previous studies, allows you to quickly synthesize the results of these studies and point out one or several relevant outcomes that are highlighted in the matrix. The emphasis in a matrix-style review paper therefore, is to primarily provide a lot of summary of research work that has been done with little critiquing.

You may of course write your review using a combination of the two review formats mentioned above. For example, you can provide a critique based on certain information that you incorporated into the matrix (e.g. sample size, methodology, results, etc). Use your understanding of your research project and the research articles that you have identified in Research 2 to determine the best way to write your review.

**MOST IMPORTANT:** Consult your research advisor on exactly how he/she wants you to write out your literature review.
Grading

Grading of your document will be done by myself and your research advisor based on the following:

- **General quality (25%)**
  - Proper format including Cover page, Contents page, in-text citations and Reference list
  - Ease of reading (clarity of writing style)
  - Logic and elaboration
  - Proper grammar and spelling

- **Responsiveness to feedback from research advisor and/or me (25%)**

- **Scientific quality (50%)**
  - Originality in interpretation of cited articles including critiquing skills
  - Originality and validity of conclusions

• Your report will be given a score that represents an overall impression of the work you have done. A score of:
  - 90 – 100% corresponds to an A grade. All aspects of the report are strong. One or two areas may be average but the overall strength of the report is sufficient to overcome the minor deficiencies.
  - 80 – 89% corresponds to a B grade. All aspects of the report are satisfactory with one or two areas that are weak but no significant deficiencies.
  - < 80% corresponds to a failing grade of F. The report is of unacceptable quality. In general, failure to follow instructions constitutes a deficiency, which often times will lead to unacceptable quality of work. **The following are examples of unacceptable quality of work:**
    - Failure to format the document correctly (e.g., Cover page, Contents page, citation style in the text and Reference list)
    - Failure to improve the document after receiving feedback from the research advisor or me
    - Submitting the document past the stated deadlines. **NOTE: You may negotiate with me to submit your document later rather than rush your work to meet the deadlines.**

If the document is deemed to be of unacceptable quality, you may be required to submit another report within 2 days on a topic chosen by me, or sit for an oral examination on your own, or both, depending on the seriousness of your deficiencies.

- Finally, keep in mind that even though the Literature Review section is graded this semester, it is expected that you will continue to update and refine your Literature Section between now and Research 6. Therefore, it will be subjected to another round of grading in Research 6 when you submit the entire research report (that includes the Journal Section).
FAQ

1. Are the Title page and Contents page required? Yes, and follow the templates exactly as indicated. Do not leave anything out. Do not include information that are not in the templates.

2. Do I have to combine my lit review with other members of my research group? Yes, submit one document (i.e., one file) that represents the groups' collective effort (including the Title page and the Contents page).

3. How complete must the lit review be, since we are expected to continually update it from now through Research 6? If you know what your research will be about, then the lit review that you turn in this semester should be complete and thorough so that you only have minor changes to make later. If you have a good excuse to work on a section of the paper later, use asterisks or yellow highlights and indicate what you will be working on. If you do not yet have a research topic (e.g., for those working on a case report), then use asterisks or yellow highlights to indicate what you plan to do.

One particular section of the lit review that may be submitted as incomplete is the Overall Summary section. Do not leave it blank. Instead, write a draft paragraph or two to demonstrate that you understand what your research project is about. Indicate in yellow highlights that you will work on the section next year after you've collected your research data and seen the results.

Here is an example on using yellow highlights to indicate that you have unfinished work:

4. Will we be penalized if we do not turn in a draft of the lit review? No, you will not, but I highly recommend that you do it so that you'll know whether your work is acceptable or not before your research advisor and I grade it. Keep in mind that we will focus on the scientific quality of your work. You will be responsible for formatting the document correctly.
5. **How complete do you want the draft to be?** Do your best and turn in a finished draft, i.e., as if it will be graded. Use yellow highlights to indicate areas that you are still working on. Otherwise, we will not be able to tell whether you made a mistake of omission.

6. **Should we also show our work to our research advisor?** Yes, definitely consult your advisor before you do anything. If they tell you to “do what you learnt in Research 1”, then go ahead and implement it (and consult with me if you like). Otherwise, follow what they want, i.e., what topics to review, how to organize them, etc. You should also ask if they have relevant articles to recommend, what journal style to cite the paper, etc. Use the APA style if they don’t have a preference.

7. **If I have questions, how do I decide whether to consult with you or my research advisor?** For the case assignments, do not ask your advisor for help at all. This part of the course is not their responsibility. They have no role in grading your work. For the literature review, seek your advisor’s guidance for questions about what topics to review, contents of the matrix table (or they may want you to leave out the table), citation style, etc. Come to me if you have questions that have to do with the administrative aspects of the paper, e.g., formatting, technical assistance with EndNotes, creating the matrix table, PubMed search, etc.

- Good luck with your research project!