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EMP 879: Statistics in Energy Medicine Research (3 credits)

Course:
Mentorship in Statistical Analysis

Catalog Description:
This course is designed to be taken concurrently with the Thesis Proposal and Thesis Project course by those participants who elect to complete a research project that requires the design, collection, analysis and presentation of original field data. Participants are mentored through all aspects of proper statistical analysis (including design of the project and data collection, data collection, data analysis, and presentation of the results) using their research project as the guiding vehicle and teaching example. All of the statistical principles and techniques taught will be immediately applied to their research project. University guidelines, the research parameters of the Energy Medicine field, and the guidelines for acceptable statistical practice govern all aspects of the data analysis completed in the research project.

Prerequisites:
Whether working toward their masters, doctorate all participants must be concurrently working on a research project that requires the collection and analysis of data.

Course Objective:
To fulfill the requirements of the Masters Thesis Proposal and Thesis Project course, participants may elect to write a "traditional" academic paper of 50 or more pages, or for the Masters Thesis Proposal and Thesis Project course they may complete a research project representing original work by the participant. For those who elect to complete a research project (or study), the project may require the design, collection, and analysis of data collected from research subjects (field data). The purpose of this course is to mentor the participant through the process of properly designing the study, collecting and analyzing the data, and presenting the findings. That is, the purpose of this course is to guide the participant through all statistical aspects of their research project to ensure that their quantitative analyses are sound and conform to the standards set forth by the Energy Medicine field, and the statistics profession.

Using their specific research project as the teaching example, the participants will learn:

- The role statistics plays in quantitative research.
- The difference between analytical and enumerative research.
- The relationship between the field of statistics and intuitive insight.
- Some key principles of variation and their impact in inference.
- The difference and relationship between data and information..
- How to clearly define the objective of their project, study or experiment.
- How to clearly formulate a research hypothesis.
- How to statistically design how the project, study or experiment is conducted.
- How to determine what data to collect, and how to effectively collect it.
- How to effectively analyze the collected data and transform it into information.
- How to effectively present the findings.
- To identify both the extent and the limitations of their research.

Course Topics:

- Understanding research as a system, and the role of statistics in that system.
- The difference between analytical and enumerative research.
- Statistical integrity. The relationship between intuition and statistics.
- Elementary principles of variation – a key to effective research and analysis.
- The difference and relationship between data and information.

- The relationship between sample and population.
- Research objectives and hypotheses.
- Statistical design of experiments, studies or projects.
- Data collection methodologies. Elementary metrology.
- Elementary survey (questionnaire) design – if appropriate to the research project.
- Handling errors and omissions in data.
- Graphical analyses of data.
- Numerical analyses of data.
- Graphical, numerical and other presentations of the findings.
- The limitations of research or a study. What the findings say and don't say.

COURSE DELIVERY STYLE

Distance Education - Coursework is completed at a location determined by the student utilizing a computer that has the ability to play audio and video clips, with Microsoft Office Word, Excel, PowerPoint, Adobe Reader, along with a current web browser, internet connection and email address. Contact and communication with distance students is typically conducted by telephone, Internet, Skype, text chat, and email. Students are also encouraged to contact the University by facsimiles, and postal mail, and by personal visit to the University.

All lessons, coursework and papers must be copied to lessons@energymedineuniversity.org from both the student and professor.

Textbook:
The only required textbook for this course is Statistics Without Tears: A Primer for Non-Mathematicians, by Derek Rowntree (paperback). At least the first two chapters should be read as part of the foundational learning. Several faculty provided handouts (short) will also be required reading. Additional recommended reading from the reference list below and other faculty provided sources will be tailored to the participant's specific research project and analysis needs.

Reference Books:
- Huff, D. How to Lie with Statistics, (paperback)
- Bhattacharyya, G.K. and Johnson, R.A. Statistical Concepts and Methods.
- Box, G.E.P., Hunter, W.G., Hunter, J.S. Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building.
- Cleveland, William S., The Elements of Graphing Data.
- Tufte, Edward R. The Visual Display of Quantitative Information, Envisioning Information, Visual Explanations.

Course Schedule:
The course schedule will follow the participant's research project schedule. For Masters students, their pace through the concurrently attended course Thesis Proposal and Thesis Project, effectively dictates the pace through this course. If the participant wishes to enroll in this course, it is very critical that they enroll BEFORE their research project has commenced.

Course Assignments:
There are no formal course assignments outside of the completion of the research project. The "assignments" will be completed as the project progresses through its design, data collection, analyses, and presentation of findings stages.

Note: Mentorship in Statistical Analysis

Further Discussion About this Course:
As stated in the syllabus, this course is designed for all Doctorate students conducting a research project that will require the design, collection and analysis of data. This course is intended to be taken concurrently with the Doctoral Proposal and Project course.

Course Objective:
The objective of this course is to assist the participant with any or all statistical aspects of their research project while teaching them about statistical analysis. This includes the statistical design of the study and how the data will be collected, the collection of data, data analysis, and the presentation of the final results. Unlike a typical university introductory statistics course, that will likely be of little help to the participant's specific research and analysis needs, this course will be tailor fit to each individual participant and their research project. The guidance and instruction provided (consulting, really) will address what is specifically needed to complete the statistical design, data collection, analysis and summary for the research project. That is, what is taught will be immediately applied to the participant's project. An assumption underlying this course is that the participant is not as interested in taking a formal statistics class as they are in getting assistance with the statistical aspects of their research project. The participant will certainly learn a great deal about proper research and statistical analysis, but it will be practical, useful, and germane to their work – not to mention interesting and fun! What is learned can be easily carried forward to future research projects. One intention of the course is that the participant will come to appreciate statistics as a useful ally (if they don't already), rather than a dull, useless, and unapproachable subject that it's often taught to be.

Very Important Note:
If a student wishes to enroll in this course, it is very important to do so before they commence their research project. Do not wait until you have started or completed some of the research project, because the most important aspect of the statistical analysis is its initial design. No sophisticated statistical analysis technique can salvage a poor statistical design that yields flawed data. Garbage in will yield garbage out. Regardless of how simple your study may or may not seem, it is advisable to seek statistical guidance at the initial stage of the project.

Student's Statistical Background:
The student's statistical knowledge can range anywhere from none to highly advanced. This course will target the guidance and instruction accordingly and as needed.

Timeline:
There is no formal timeline for this course. Like the course schedule, the course timeline is governed by the research project timeline.

Credit and Course Design:
Three (3) credits. The course activity is faculty mentor assisted with self-study.

Placement in Curriculum:
Again, do not wait until the project is underway before enrolling in this course because a critical part of the statistical analysis is the initial statistical design of the study. If the design is not done properly, the collected data will likely be faulty or possibly worthless, negatively impacting the project.

Grading Policies:

Course grades are based on the following elements of a student's participation and accomplishment. In determining grades the instructors generally use the following formula:

Reading required texts and on-line readings – 20%
Email and Internet Discussions – 20%
Course Paper or Project – 40%
Essay or Oral examination – 20%

Using this technique, there will be 100 points assigned to the course. Final semester grades will be calculated as follows:

92-100 points = A range
86-91 points = B range
80-85 points = C range
70-80 points = D range
Under 70 points = F
0 points Incomplete = I

Course Completion Timetable:
The completion timetable for this course will be identical to the timetable established for the research project. For students, that timetable will be established with the instructor of the Doctoral Proposal and Thesis Project course.

Communication:
Contact between participants and faculty can occur in a number of ways, including phone, fax, email, and in-person consultations. It is anticipated that frequent contact will be made throughout the course as the research project proceeds. Whereas the number of contacts will vary according to the specific needs of the participant and research project.

Appendix A – Faculty Biography:
Chuck Laurenson earned his B.A., Honors, in Applied Mathematics at Claremont McKenna College, his M.S., Statistics at the University of Wisconsin, and MIM at the Academy of Intuition Medicine®. He has over 21 years of experience in the high tech industry as a senior statistician, division quality manager, and CEO both conducting and directing a wide variety of statistical analyses and research projects. He has developed over 20 courses taught to over 3,000 students on various topics in applied statistics, statistical quality control, sampling, quality management, and leadership.

Appendix B – Office Hours:
I can be reached by telephone between 8:00 AM and 6:00 PM, Monday through Friday. If I am not in the office a voicemail system will record a message. I return most calls within a few hours. I usually check email daily. Other contact arrangements can be made depending upon the needs of the student.