King Fahd University of Petroleum & Minerals
Information and Computer Science Department
ICS 500: Research Methods and Experiment Design in Computing (3-0-3)
Syllabus – Spring Semester 2023-2024 (232)

Class/Laboratory Schedule: 2 lectures per week, 75 minutes each (MW)
Course Website: Blackboard

Instructor:	Prof. Mohammad Alshayeb	**Email:**	alshayeb@kfupm.edu.sa
Phone:	860-4874	**Office Location:**	22/308
Class Time:	MW 18:45-20:00	**Location:**	24-135
Office Hours:	MW 10:00-10:50 AM & M: 17:30-18:30. Also, online by appointment		
Instructor homepage:	http://www.alshayeb.com		
Submissions	All submissions on Blackboard		
Mode of contact	KFUPM Email Only		

Course Catalog Description
Integrated treatment to the models and practices of experimental computer science. Topics include scientific methods applied to computing, computational problem/solution characterization, quality metrics and performance estimation of computation systems, uses of analytic and simulation models, design of experiments, interpretation and presentation of experimental results, hypothesis testing, and statistical analyses of data.
Prerequisite: STAT 319 or equivalent

Course Objectives
1. Prepare students for conducting research in computing.
2. Motivate the need for experimental techniques in computing-related research.
3. Cover principal experiment design methods applicable to computing-related research.

Course Learning Outcomes
Upon completion of the course, you should be able to:
1. Learn how to plan, conduct and report on experimental and empirical investigations.
2. Understand the key steps of a research project.
3. Create/evaluate experimental studies/data.
4. Understand fundamentals of experimental design.
5. Understand and control confounding variables.
6. Understand and apply appropriate data analysis techniques.
7. Understand and create the underlying logics of empirical studies in reasoning out conclusions.
8. Use statistical tools to reduce the number of simulations that need to be performed of a computer system.
9. Design a set of experiments to obtain the most information for a given level of effort.
10. Ability to review and write scientific papers.

Textbooks
- Claes Wohlin et al., **Experimentation in Software Engineering**, Springer. ISBN 978-3-642-29044-2, 2012.
- Forrest Shull et al., **Guide to Advanced Empirical Software Engineering**, Springer, ISBN 978-1-84800-043-8, 2008.

References
- Journal and conference articles, research reports, and other materials as appropriate.

Assessment Plan

Assessment Tool	Weight
Research Papers Summary & Discussion	5 %
Research Paper Review	5 %
SLR	10%
Term Paper	40 %
Midterm [March 20, 2024]	15 %
Final Exam (As scheduled by the registrar)	25 %

Topics covered

- Introduction to research
- Introduction to referencing
- Empirical strategies
- Measurement
- Systematic literature review
- Surveys
- Case Studies
- Experiment Process
- Experiment scoping
- Experiment planning
- Experiment operation
- Experiment data analysis and interpretation and reporting

Research Papers Summary & Discussion

Each student is expected to discuss and present one research paper. A presentation by the student should be made to the class, and a maximum of a 1-page summary report should be submitted to the instructor. The student is responsible for selecting the papers which need to be approved by the instructor.

Research Paper Review

Each student/team is required to read and critique a research paper during the semester. The student is expected to submit a report on the pros and cons of the paper and present his/her review to the class. The paper will be selected by the instructor.

Systematic Literature Review (SLR)

Each student/team will conduct a systematic literature review related to the term paper proposal. The findings should be reported in the form of a **publishable** work.

Term paper

Each student should conduct an in-depth study of advanced topics in computer science or software engineering of their selection. Detailed term paper guidelines and requirements will be distributed in a separate sheet.

General Policies

- If the number of absences exceeds 6 classes (even for online classes), DN grade will be reported.
- An official excuse for any class absence must be presented within one week after that class.
- No late or email submissions will be accepted unless agreed beforehand with the instructor.
- No makeup will be given.
- Participation in the class is strongly encouraged.
- Students must be aware of and adhere to all KFUPM regulations.