

King Fahd University of Petroleum and Minerals
Electrical Engineering Department
Center for Energy and Geo-Processing (CeGP)

EE490 Undergraduate Research

Term XXXX

EE Undergraduate Research

Guidelines to Students

KFUPM- Georgia Tech

Important Disclaimer

This version is a draft. It cannot be used for any legal action and the institutions are not responsible for the content. It is only meant to provide early information. Your feedback and questions are welcomed at muqaibel@kfupm.edu.sa

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Introduction

The skills that students acquire during their academic years play an important role in their future success. The growing adoption of undergraduate research (UR) has changed education in the world over the past twenty years. Rather than simply attending lectures and taking notes, undergraduate students at leading Universities like Georgia Tech (GT) have the option to spend part of their academic learning hours conducting research with one or more of the faculty members.

There are a few factors that define an undergraduate research experience. To distinguish undergraduate research from other project-based experience, students are expected to gain literature review skills; read conference and journal papers and understand the scientific publication terms; identify research methodologies: statistical, theoretical, experimental or simulation; and generate results and critically compare and analyze them.

Why would I join Undergraduate Research?

For undergraduate students, the research experience is motivated by the following: it gives them a chance to find their passion and identify their areas of interest. Usually such research experience leads to ideas for senior design projects, master theses, or PhD dissertation topics. Successful cases will lead to journal publications and hence an enhanced application to a graduate program. Other students would like to add undergraduate research to their resumes while others are simply fulfilling their credit hours while gaining different experience. Other than regular HW, quizzes, exams ...class room experience.

For the proposed Global Research Experience for Undergraduates (GREU) program between KFUPM and GT, students will be further motivated by gaining international experience; exposure to different culture and school; students will have a chance to prove themselves for higher study admission. This is the case for students at both institutions. KFUPM students who visit GT as exchange students are advised to join the undergraduate research experience.

The maximum number of undergraduate researchers in the course is limited. Students with research interest, and high academic high performance are encouraged to join.

Course Description

This course provides a practical introduction to research methodologies, and research community. Students in the course learn about the nature of applied research and the iterative process of research writing. The course teaches students how to work in a mentor-mentee relationship with a KFUPM faculty advisor, post

graduate fellows, and graduate students. The course helps students to identify a study topic, organize a literature review, and select appropriate research methodologies. By the end of the course, students will complete a technical paper that includes an introduction, problem statement (significance of study), literature review, methods section, results and analysis, discussion, conclusions, and references. Students will be encouraged to participate in conferences and present their work.

Course Objectives

- To familiarize the students with the concept of research and its components.
- To discuss the different research methodologies: statistical, theoretical, experimental or simulation.
- To understand the structure of technical proposal: problem statement, deliverables and plan the time for executing the research.
- To critically evaluate the findings of the research and reach at conclusions.

Course Learning Outcomes

After successfully completing the course, the students will be able to

1. Read and understand conference and journal papers and their scientific terminology.
2. Identify the main contributions of a scientific research paper.
3. Write literature review for a given research problem.
4. Identify the appropriate research methodology: statistical, theoretical, experimental or simulation
5. Critically compare and analyze results
6. Identify the different means to disseminate research results through journals, magazines, conference and technical congregations and conferences to present his findings.

Course Material

Most of the reading material will be related to the specific research problem. Blackboard contains additional course readings. Course readings are selected chapters from some of the latest introductory research methodology textbooks, research journal articles, and specialized research training guidebooks.

Textbook:

References will be provided through the mentor.

Other useful references and material:

- Gina Wisker, *The Undergraduate Research Handbook (Palgrave Study Skills)*, ISBN-13: 978-0230520974, 2009

- Colin Robson, How to do a Research Project: A Guide for Undergraduate Students, 1st Edition, Blackwell Publishing 2007, ISBN-13: 978-1405114905
- Paul D. Leedy and Jeanne Ellis Ormrod (Author): Practical Research: Planning and Design (11th Edition), ISBN-13: 978-0133741322
- Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams. The Craft of Research, Third Edition (Chicago Guides to Writing, Editing, and Publishing), ISBN-13: 978-0226065663
- John W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, ISBN-13: 978-1452226101

Instructor for term 172

Dr. Ali Hussein Muqaibel, Electrical Engineering (EE) Department, KFUPM

Prerequisites: Junior standing

Tentative Grading Policy:

Item	Equivalent to	Points
Proposal	HWS	5
Weekly Progress Report		10
Selected Readings (Quizzes)	Quizzes	10
Literature Review Report	Exam 1	15
Reproducing results in pre-selected or pre-assigned paper or two	Exam 2	15
Term paper	Term Project	25
Presentation	Final	20

The term paper will bring new ideas to improve the current research. Before the final grade, the paper must be submitted to conference or a journal and the student is expected to go through the submission process.

1.6 Breakdown of Course Contents

One meeting per week with graduate mentor and one meeting per week with the Professor. There will be some self-reading material and students will be quizzed on the material. The material will come from selected sources. The student will gain and apply knowledge to a specific research problem related to the field of the instructor. Possible research areas: robotics and automation, distributed compression, autonomous vehicles and fusion of sensors, devices and sensors for healthcare Power load distribution in Saudi Arabia...etc. Specific research problems will be identified to clearly have a research nature and distinguish the course from other senior design problems.

Week	Module	Topic
1-2	1	Overview of the course, student expectations, & introductions Problem Statement, Significance of Study, Proposal , Methodology, References, & Timeline
3-4	2	Literature Review
5-7	3	Research Methods: Statistical, Experimental, Analytical, Simulation
8-10	4	Discussion and Analysis of Results
11-12	5	Writing Technical Papers
13-14	6	Presentation
15	Term Paper Presentations & Final Paper submission	

Topics for the current term (to be announced before the beginning of the term)

Our Undergraduate Researchers (scholars) will be provided seating whenever possible in an associated research center or lab. The student is expected to spend a minimum number of hours in the lab to interact with the research fellows.

#	Title	Center	Mentor	Maximum # of students	Related Team from Georgia Tech

CeGP: Center of Energy and Geo-Processing.

TRL: Telecommunication Research Laboratory.