M.E. Rinker, Sr. School of Construction Management
College of Design, Construction & Planning
University of Florida

BCN 6036
Research Methods in Construction

INSTRUCTORS:

Dr. Ravi Shankar Srinivasan
Director, UrbSys (Urban Building Energy, Sensing, Controls, Big Data Analysis, and Visualization) Lab
Director, Graduate Programs and Research

Dr. Eva Agapaki
Director, Digital Twins Lab
M.E. Rinker, Sr. School of Construction Management, University of Florida

Note: This course was originally developed by Dr. Ian Flood, Professor of Construction Management. Drs. Srinivasan and Agapaki have made modifications to this original course.

SCHEDULE AND OFFICE HOURS:

Office hours right after the class periods. For additional meetings, please email instructors via CANVAS.

PREREQUISITES:

Graduate Standing or Instructor Permission.

SUBJECT:

The course is concerned with the successful design, execution, and reporting of research within the construction disciplines. The course is relevant to both research that is conducted within an academic environment and that conducted within a business/commercial environment. Students will become familiar with the research proposal development process and the statistical, computational, visualization and presentation tools available to the researcher.

OBJECTIVES:

The primary objective of the course is to develop the knowledge and skills necessary to develop and perform a successful research project within any of the the construction disciplines. In particular, students will learn: (i) principles and theory of the scholarly research process; (ii) how to develop an effective proposal for a research project; (iii) the methods and procedures of research, including, performing effective literature surveys and reviews, data collection (such as surveys and case studies), modeling and simulation, hypotheses testing, analysis of results, inference, and report writing and presentation. The course will include formal lectures, class discussions, case studies, guest speakers and laboratory sessions.

COURSE CONTENT:

The course material (including lecture notes, presentations, interactive media and assignments) should be followed in the order specified in class. The components of the course are as follows.

Introduction to Research Methods

Developing a Proposal for Research

Performing the Research

Reporting the Findings

Includes examples of mid-semester and end-of-semester exams for review.

The components of the term paper

REFERENCES:

There are no books that you are expected to purchase for this course, however, the first in the following list (Research Methods for Construction) is freely available to UF students through the UF Library system as an online book, and you will be expected to access it throughout this course.

Online access to the following book is required:

Research Methods for Construction (Links to an external site.), by Richard Fellows and Anita Liu, Malden Mass., Blackwell Science, 1997. This is freely available online to students through the UF library. To access the book you must either be on-campus or logged on to the campus system with the vpn client, then: (1) shift+click on the above link or (2) go to the electronic books collection of the UF library and search for the title.
Architectural Research Methods, (Links to an external site.) by Linda N. Groat and David Wang, 2013. This is freely available online to students through the UF library. To access the book you must either be on-campus or logged on to the campus system with the vpn client, then: (1) shift+click on the above link or (2) go to the electronic books collection of the UF library and search for the title. (Links to an external site.)
The following books are recommended for general reference:

Dissertation Research and Writing for Construction Students, S.G Naoum, Butterworth-Heinemann, Boston, Mass, 1998.
Survey Research Methods, Earl. R.Babbie, Wadsworth, Belmont, CA, 1973.
Case Study Research Design and Methods, 2nd Ed., Yin, R.K., Sage Publications, Beverly Hills, CA, 1984.
Research Methods, by Roger L Dominowski, Prentice Hall, Englewood Cliffs, NJ, 1980.

INSTRUCTIONS ON SUBMITTING ASSIGNMENTS:

Online submission of assignments requires files to be in either MS Word, Excel or PDF format - each assignment identifies the file type(s) that it permits. All answers to an assignment must be put in the correct order with the question clearly identified, and submitted within just one file. Placing all parts of a question in one file can be achieved by several means, for example: (a) in MS Word you can type-in answers, draw pictures, and cut&paste or import images and other objects; (b) Windows provides an easy to use Snipping Tool that allows you to gather images from any part of the screen and then paste them into the file to be submitted; and (c) you can use a scanner to create a single pdf file for submission.

Letter Grade   % Grade
A   >= 93.3
A-   >= 90
B+   >= 86.7
B   >= 83.3
B-   >= 80
C+   >= 76.7
C   >= 73.3
C-   >= 70
D+   >= 66.7
D   >= 63.3
D-   >= 60
E   < 60
 Homework that is submitted late will usually be penalized at a rate of 10% per day.

GENERAL:

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

Students must respect all copyright laws.

The university honor code will be enforced.

It is recommended that you KEEP REGULAR BACKUPS OF ALL YOUR FILES IN CASE OF A SYSTEM FAILURE!
TERM PAPER:

Part of the course requirement is the completion of a term paper. A handout detailing the term paper requirements is provided at this course website. The term paper will involve the development of the descriptive section a research proposal.

This will include the presentation of a PowerPoint summary of your term paper orally, which must also submitted online.

I will set deadlines for completion of certain interim stages of the term paper (such as completion of the outline, and first draft).

TOPICS:

The following provides an overview of the topics that will be covered and the planned order in which they will occur. This is a tentative schedule, subject to change. Note, class time will be divided approximately equally between: (i) lectures; (ii) class discussions, tutorials, and case studies; and (iii) computer laboratories.

MODULE 1: INTRODUCTION TO RESEARCH METHODS:

Weeks 1 and 2: General introduction to the course. What is research? Ethics in research.

- Classification of research methods.

- Theories and paradigms.

- Ethics in research and ethics of Artificial Intelligence

- Research styles.

- Quantitative and qualitative approaches.

MODULE 2: DEVELOPING A PROPOSAL FOR RESEARCH:

Week 3: Selection of a topic for research.

- Resources.

- General and specific subject determination.

- Evaluating alternative topics.

Week 4: Writing the proposal.

- Aim, objectives, scope, hypotheses, methodology, program, deliverables, summary, abstract, keywords, references and bibliography.

MODULE 3: PERFORMING THE RESEARCH:

Week 5: Initial research.

- The research process.

- Review of literature and theory.

Weeks 6, 7, and 8: Research approaches.

- Experience.

- Modeling and simulation.

- Experimental design.

- Data Analysis.

- Qualitative approaches.

- Quantitative approaches.

Week 9: Introduction to AI & ML in research.

- Overview of fundamental AI & ML methods in construction.

- Machine learning.

- Computer Vision.

- Natural Language Processing.

- Robotics.

Week 10: Ethics in research.

- Collecting data from respondents (surveys, questionnaires, interviews, case studies, multiple methods, etc).

- Observing system behavior (observing physical systems, naive users, etc).

Weeks 11, 12 and 13: Data-driven and AI research methods.

   - Examples.

   - Linear regression with example demonstration on Google Colab.

- Logistic regression with classifier demonstration on Google Colab.

- Decision trees with example demonstration on Google Colab.

MODULE 4: REPORTING THE FINDINGS:

Week 14: Results, inferences and conclusions.

- Validity of results.

- Error.

- Interpreting the results.

- Drawing conclusions

Week 15: Reports and presentations.

- Reporting in general.

- Written report structure.

- Oral presentation.

PARCIPITATION:

Class participation is required. Upon providing adequate documents (under "Absence Documents"), absence(s) due to "illness" and "family emergencies" can be excused. You may also have up to three unexcused absences throughout the semester. Further unexcused absences will negatively affect your grade.