

CS 4050 : RESEARCH METHODS IN COMPUTER SCIENCE

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|------------------------|---------------------------------|-------------------------|
| <i>Semester Hours:</i> | 3.0 | <i>Contact Hours:</i> 3 |
| <i>Coordinator:</i> | Michael Decker | |
| <i>Text:</i> | Readings provided by instructor | |
| <i>Author(s):</i> | VARIED | |
| <i>Year:</i> | Varied | |

SPECIFIC COURSE INFORMATION

Catalog Description:

Techniques and conventions in the design, conduct, and support of scientific research in computer science. Research methods, evaluation of approaches, and presentation and dissemination of results. Domain specific research methods in such application areas as algorithms, human-computer interactions, software engineering, and cybersecurity. Credit cannot be earned for both CS 4050 and CS 5050. Prerequisite: Grade of C or better in CS 3350.

Course type: **ELECTIVE**

SPECIFIC COURSE GOALS

- I can formulate a research problem.
- I can evaluate different research works.
- I can apply an appropriate research methodology for a given research problem.
- I can explain the ethical responsibilities of scholarship.
- I can create a research proposal.

LIST OF TOPICS COVERED

- Introduction (~7%)
 - Course overview
 - Logical foundations of empiricism
 - Scientific method
- Research Techniques (~28%)
 - Controlled experiments

- User studies, surveys, and survey tools
- Empirical studies
- Formal proofs
- Mathematical Modeling
- Performance metrics
- Simulation
- Data gathering, validation, and analysis
- Proper use of statistics
- Closed Form vs. approximate solution
- Application Domains (~7%)
 - Examples
 - Simulation modeling
 - Software Engineering
 - Algorithm Analysis
 - Human Computer Interaction
 - Cybersecurity
 - Deterministic and or Stochastic Modeling
 - Optimization
- Proposing and Performing Research (~22%)
 - Types of papers (survey, position, research, etc.)
 - Problem identification
 - Literature review and citation
 - Research question and hypotheses
 - Identifying subjects
 - Selecting appropriate methodology
 - Writing a proposal
 - Assessment and validation
- Compilation (~29%)
 - Project management
 - Technical writing, formats
 - Peer review and publication venues

- Presentation and tools
 - Possible student presentations
- Conduct of Research (~7%)
 - Ethics
 - Plagiarism
 - Intellectual property
 - Legal issues