

INDRAPRASTHA INSTITUTE OF INFORMATION TECHNOLOGY, DELHI
CSE791: Special Topics: Design Science Research Methods in Information
Technology
Monsoon Semester 2010

The course syllabus provides a general plan for the course; deviations may be necessary

INSTRUCTOR:

Name: Vijay Vaishnavi
Office Hours: By appointment
E-Mail: vijay@iiitd.ac.in; vvaishnavi@cis.gsu.edu

COURSE:

Time: Mondays, Thursdays, 2:00 PM - 3:30 PM
URL:

PRE-REQUISITES: None

POST-CONDITION (on student capability after successfully completing the course):

- Define and describe the essential characteristics of design science research and differentiate it from other types of research;
- Discuss in oral and written form the key ideas and intellectual currents underlying design science research and its methods;
- Present a well-developed argument, in written and oral forms, for the importance of a selected research topic within the theme of the course (design science research) and articulate a proposal for studying the research topic.
- Conduct design science research and write a paper that with refinement could be submitted to a scholarly conference and expanded into a journal submission;

BRIEF DESCRIPTION

The course develops skills for implementing and evaluating the techniques and methods that are used in the various phases of design science research. After an exposure to the characteristics that differentiate design science research from other types of research, research methods and techniques used in the various phases of such research will be discussed in the context of exemplars of such research. The exemplars will be from a number of information technology areas and will include some of the publications of the IIITD faculty. Potential topics that will be covered in the course

- Understanding Design Science Research
- Using Patterns to Illuminate Research Practice
- Creativity Patterns
- Problem Selections and Development Patterns; Literature Search Patterns
- Suggestion and Development Patterns
- Evaluation and Validation Patterns
- Publishing Patterns

METHODOLOGY

Assigned readings, Class participation and discussion, class presentation, project and report, research proposal and paper

CONDUCT OF THE COURSE

The course will be conducted as a seminar. Each student is expected to participate in every class and read the assigned material *before* the class. The grade will be determined in part, on the basis of the quality of the student's preparation and participation (short presentations, leadership of class discussion, and participation in class discussions).

COURSE REQUIREMENTS AND GRADING

Class participation and discussion: 15%

Take home test: 25%

Team project: 20%

Research proposal and paper: 40% (proposal: 5%)

CLASS ATTENDANCE AND PARTICIPATION

Students are expected to attend all classes (and to arrive on time!). In evaluating class participation, both the quantity of comments (i.e. how many times a student speaks) and, more importantly, the **quality** of the comments will be taken into account. The quality of the students' comments will be evaluated using the following criteria:

- Does the comment demonstrate that the student is ready to contribute to the discussion or does the comment show that the student is unprepared for the discussion?
- Is the point made concisely, or is it buried in a long, rambling, diatribe?
- Does the comment move the discussion to an important area or does it just rephrase what has already been said?

TAKE HOME TEST

The take home test will be similar to the design science research proposal portion of comprehensive exams. The students will be given an existing paper, and then have about three weeks to develop a design science research proposal that is related to and extends on the research presented in the paper.

The proposal should include a description of the problem, the importance of the problem and the research questions/issues, the approach to be followed in conducting the research, the methodology to be used and its appropriateness, and the expected significance of the research. The proposal should include literature review in the context of the problem and its importance or in other contexts.

Students will be evaluated on their ability to make a reasonable case for the importance of the research proposed, the thinking that is exhibited in advancing an approach for the problem, justification for the appropriateness of the approach and the methodology, and the intellectual and broad contribution that the research is expected to make. Students will also have to show that the proposed research will make a contribution to knowledge.

RESEARCH PROPOSAL AND PAPER

Each student will develop an actual design science research paper in an area of interest.

This paper, after some refinement, should be suitable for submission to an IT conference such as WITS (Workshop on Information Technology & Systems) or DESRIST (International Conference on Design Research in Information Systems and Technology), and the expanded version of the paper should have the potential for submission to a scholarly journal.

As a first step toward carrying out the research project, a short research proposal needs to be written. A template for this proposal as well as a sample proposal will be made available. You should adhere to the 6-page limit and format of the sample proposal. Any additional material can be attached if needed as an appendix to the proposal.

Progress of the research paper needs to be communicated to the instructor every two weeks through e-mail and in person when needed. In addition each student may be asked to discuss the progress of the project in class.

CLASS PROJECT

- Justify why each of the five sample design research exemplars (papers) and each of the seven new research exemplars (papers) should be treated as a *research* project and why it should be or should not be considered as a *design science research* project. (The papers have been selected such that not all the papers can necessarily be considered as design science research papers.)
- For each of the papers that you consider to be a design science research exemplar, identify and justify in detail the research patterns that were used (or could have been used) in conducting the research. This part of the project should follow the structure used for each of the sample cases in Part III of the text (Vaishnavi and Kuechler, 2007).
- Please see the Schedule of Lectures section for deadlines on submissions of different parts of the team project. The final revised report for the entire project is due on November 29.

COURSE READING MATERIALS

Text

Vaishnavi, V. K. and Kuechler, W. (2007), *RESEARCH PATTERNS: Improving and Innovating Information & Communication Technology*, Auerbach Publications, Taylor and Francis Group, New York, NY.

1: Introduction and Course Overview

[1.1] Text (Chapter 1).

[1.2] Vaishnavi, V. and Kuechler, W. (2004/09). [Design Research in Information Systems](#), January 20, 2004, last updated August 16, 2009.

URL: <http://desrist.org/design-research-in-information-systems/>

[1.3] Wikipedia: Pattern Language - http://en.wikipedia.org/wiki/Pattern_language

[1.4] Kuechler, W.L., V.K. Vaishnavi. The Emergence of Design Research in Information Systems in North America, *J. of Design Research*, 2008.

2: Understanding Design Science Research

[2.1] Text (Chapters, 2 and 3).

[2.2] Kuechler, B. and Vaishnavi, V. (2008). Theory Development in Design Science Research: Anatomy of a Research Project, *Proc. DESRIST 2008*; expanded version has appeared in *EJIS*, 2008.

[2.3] Gregor, S. [Theorizing in the Sciences of the Artificial](#), Working Paper 2010.

[2.4] Gregor, S. and Jones, D. (2007). [The Anatomy of a Design Theory](#), *Journal of Information Systems*, Volume 8, Issue 5, Article 2, pp. 312-335, May 2007

[2.5] Hevner, A., March, S., Park, J., and Ram, S. (2004). [Design Science in Information Systems Research](#), *MIS Quarterly* 28(1): 75-105.

3: Sample Design Science Research Exemplars

[3.1] Vaishnavi, V., Buchanan, G. and Kuechler, W. (1997). A Data/Knowledge Paradigm for the Modeling and Design of Operations Support Systems. *IEEE Transactions on Knowledge and Data Engineering*, **9**:2, 275-291.

[3.2] Codd, E. (1970). [A Relational Model for Data for Large Shared Data Banks](#), *Communications of the ACM*, 13(6), 377-387.

[3.3] Denning, P. (1968). [The Working Set Model for Program Behavior](#), *Communications of the ACM*, 11(5), 323-333.

[3.4] Hoare, C. (1978). [Communicating Sequential Processes](#), *Communications of the ACM*, 21(8), 666-677.

4: Proposal Writing; Using patterns to illuminate research practice

[4.1] Text (Chapters, 4 and 5).

[4.2] Mohan, K. (2001), Maintenance and Evolution Patterns: Automated Detection and Retrieval, CIS Comprehensive Examination Proposal.

[4.3] RCB Research Proposal Guidelines

[4.4] Vaishnavi, V.K. (2004). Object-Oriented Product Metrics: A Structural Framework, Sample RCB Research Proposal.

5: Creativity

[5.1] Text (Chapter 6).

[5.2] Wikipedia: Creativity - <http://en.wikipedia.org/wiki/Creativity>

6: Problem Selection and Development; Literature Search

[6.1] Text (Chapters, 7, 8, and 12).

7: Suggestion and Development

[7.1] Text (Chapters, 9 and 12)

8: Evaluation and Validation; Publishing

[8.1] Text (Chapters, 10, 11, and 12)

9: Design Science Research Dissertation Exemplars

[9.1] Petter, S. (2006), *A Process to Reuse Experiences via Narratives among Software Project Managers*, Doctoral Dissertation, Computer Information Systems Department, Georgia State University, 2006.

[9.2] Hahn, T. (2002), *Automating Reuse for Systems Design*, Doctoral Dissertation, Computer Information Systems Department, Georgia State University, 2002.

10. New (Design Science and Non-Design Science) Research Exemplars

[10.1] R. Singh, M. Vatsa, H.S. Bhatt, S. Bharadwaj, A. Noore and S.S. Nooreydzan, [Plastic Surgery: A New Dimension to Face Recognition](#), *IEEE Transaction on Information Forensics and Security*, 2010, (In Press).

[10.2] Petter, S. and Vaishnavi, V. (2007). Facilitating Experience Reuse Among Software Project Managers, *Information Sciences* 178 (2008) 1783–1802.

[10.3] [Jalote, P. and Agrawal, N. \(2010\). Using Defect Analysis Feedback for Improving Quality and Productivity in Iterative Software Development](#) (to appear in *ACM Transactions on Software Engineering and Methodology*).

[10.4] Kuechler, W. L. and Vaishnavi, V. (2006). So, Talk to Me: The Effect of Explicit Goals on the Comprehension of Business Processes, *MIS Quarterly Vol. 30 No. 4*, pp. 961-979/December 2006.

[10.5] Kuechler, W., Vaishnavi, V.K., and Kuechler, D. (2001), Supporting Optimization of Business-to-Business e-Commerce Relationships, *Decision Support Systems*, 31, 363-377.

[10.6] Goyal, V., Sureka, A., and Lal, S. [AccKW: An Efficient Access Control Scheme for Keyword-Based Search over RDBMS](#), *Lecture Notes in Computer Science*, Volume 5999/2010.

[10.7] Lee, W. and Benbasat, I. (2003). Designing an Electronic Commerce Interface: Attention and Product Memory as Elicited by Web Design, *Electronic Commerce Research and Applications* 2 (2003) 240–253.

SCHEDULE OF LECTURES:

The following scheduled list of topics **is subject to change**.

Unit	Date	Topic	Readings	Comments
1	July 29; August 2	Introduction and Course Overview	[1.1] [*] , [1.2], [1.3], [1.4]	
2	August 5, 9	Understanding Design Science Research	[2.1], [2.2], [2.3], [2.4], and [2.5]	
3	August 12, 16	Sample Research Exemplars (1) Justification for a Paper to be considered as a research paper; (2) Justification for a paper to be considered as a Design Science Research or a Non-Design Science Research Paper:	[3.1], [3.2], [3.3], [3.4], [10.1], [10.2], [10.3], [10.4], [10.5], [10.6], [10.7]	Submission⁺ and Presentation
4	August 19, 23	Proposal Writing Using patterns to illuminate research practice	[4.1], [4.2], [4.3], [4.4]	
5	August 26, 30	Creativity	[5.1], [5.2]	Short Research Paper Proposals Due
	September 2	Holiday		
6	September 6, 9	Problem Selection and Development; Literature Search	[6.1]	Patterns: Submission^{**} and presentation
7	September 13, 16, 20, 23	Suggestion and Development	[7.1]	Patterns: Submission^{**} and presentation
8	September 27, 30	Verification and Validation; Publishing	[8.1]	Patterns: Submission^{**} and presentation Sept. 30: Take Home Test Given
	October 2 - 17	Mid-Semester Recess		
9.	October 18, 21	Design Science Research Dissertation Exemplars	[9.1], [9.2]	Oct. 21: Take Home Test Due
10	October 25, 28	Take Home Research Proposal Presentations		

11	November 1, 4	Review of Design Research Patterns		
12	November 8, 11	Research Paper Preliminary Presentations		
13	November 15	Course Review and Discussion		
14	November 22			Research Paper Due
15	November 29	Research Project Presentations		Team Project Due

*See Course Reading materials

+For **sample** as well as **new** Research Exemplars

** For **new** Design Research Exemplars; the patterns are for the topic of the session