

Spring 2020

IS 663-102: Advanced System Analysis & Design

Vassilka Kirova

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IS 663 Advanced System Analysis & Design – Spring 2020

| Part I: Course and Instructor Information | |
|---|--|
| Semester: | Spring 2020 |
| Course name: | Advanced System Analysis & Design |
| Course number: | IS 663 |
| Instructor name: | Vassilka Kirova |
| Course location: | KUPF 207 |
| Course Meeting time: | 6:00 – 8:50 PM EDT |
| Office hours & location: | Monday, 6:30 – 8:30 PM ET - GITS Informatics Department (by appointment); Wednesday, 5:00-6:00 PM - Class room (by appointment) Please make sure to set an appointment with your instructor prior to any visit! |
| Email: | vassilka.kirova@njit.edu ; vdkirova@gmail.com For any email use the following subject: IS663-<additional info> |

Part II: Course Description

1. Course description:

This course develops the skills necessary to analyze, design and manage the development of enterprise-scale information system solutions, incorporating contemporary methods and effective organizational and global project management practices. It focuses on technical business system analysis and design techniques, and covers key software engineering principles, methods and frameworks, including process models, agile and lean principles, project and risk management, estimation, requirements elicitation and analysis, modeling, system and software architecture, design patterns, and quality systems. Students will actively participate in discussions, review selected articles, participate in team exercises and collaborate on projects involving analysis and prototyping of applications addressing real-world problems and integrating current and emerging technologies.

For the latest course information go to <http://njit2.mrooms.net/>
 The information below should help you plan and organize your preparation during the semester.

2. Prerequisite courses and knowledge:

- Prerequisite course: IS 631
- Required background:
 - The students are required to have knowledge of key information systems concept, software development life cycle activities, and project management issues.
 - Good understanding of data modeling techniques and database fundamentals is expected as well.
 - Good understanding of modern trends in business and information analysis, information technology, data modeling, object-oriented principles and agility are a plus
 - Undergraduate software engineering courses provide a good foundation

3. Outcomes expected upon the completion of the course:

- Good understanding of classical and modern lifecycle models, including agile methods
- Hands on analysis and specification skills, using methods such as use cases, scenarios, and user stories
- Good understanding of project management functions, including risk analysis in global and collaborative projects
- Practical knowledge of estimation techniques
- Understanding of architecture and design activities as well as the impact and opportunities provided by modern architectures and infrastructures such as SOA and Cloud computing

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- Hands on modeling skills (UML, agile UML)
- Understanding the fundamentals of Quality Assurances and quality frameworks

4. Ways that students will be assessed throughout the course:

- Team project execution and deliverables - content, mastery of methods discussed in class and creativity; team work; research and analysis skills
- Discussions -- active participation and moderation of discussions; free sharing of ideas and information related to the discussion topics; systematic progress with paper reading assignments
- Individual assignments – content, understanding of methods discussed in class and their effective user or application to the assignment; research and analysis skills
- Class participation – open contribution to the discussions and exercises, sharing, collaboration
- Final exam – understanding of the course material and demonstrated effective application of the acquired knowledge and skills to solving practical problems

5. Required & Recommended texts:

- *Lecture Notes*
Lecture notes are the basic course material for this class. The notes are made available on Moodle every semester.
- *Text* *Book*
"Software Engineering," Ian Sommerville, Addison-Wesley, England, 10th Edition, 2016.
 - NJIT Bookstore or
 - [Amazon.com – http://www.amazon.com/Software-Engineering-10th-Edition-Sommerville/dp/0133943038/ref=dp_ob_image_bk](http://www.amazon.com/Software-Engineering-10th-Edition-Sommerville/dp/0133943038/ref=dp_ob_image_bk)
- *Articles and Discussion Supporting Materials*
For the list of readings check the Course Outline available on Moodle as well as Moodle Discussions forum.
- *Books Recommended for Extra Reading*
 - "The Mythical Man-Month: Essays on Software Engineering, Anniversary Edition (2nd Edition)," Frederick P. Brooks, 1995.
 - "The Design of Design: Essays from a Computer Scientists," Frederick P. Brooks, 2010.
 - "Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum," Craig Larman and Bas Vodde, Pearson Education Inc, 2009.
 - "Practices for Scaling Lean & Agile Development: large, Multisite and Offshore Product Development with Large-Scale Scrum," Craig Larman and Bas Vodde, Pearson Education Inc, 2010.
 - "Agile Software Development with Scrum," Ken Schwaber and Mike Beedle, Prentice Hall, 2002.
 - Software Systems Architecture: Working with Stakeholders Using Viewpoints and Perspectives (2nd Edition), Rozanski, Nick, 2011.
 - "Design Patterns / Elements of Reusable Object Oriented Software," Erich Gamma, Richard Helm, Ralph Johnson, and Vlissides (known as the "Gang of 4" of "GOF"), 1994.
 - "UML Distilled: A Brief Guide to the Standard Object Modeling Language (3rd Edition)," Martin Fowler, 2008.
 - UML Documentation & White Papers: <http://www-01.ibm.com/software/rational/uml/>

6. Required software/hardware:

Free and open software; NJIT supported tools and hosting environments.

7. Web resources:

See Class information on Moodle (<http://njit2.mrooms.net/>)

8. Contacting the instructor (including turn-around time for responses)

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Please make sure to send your email to vassilka.kirova@njit.edu WITH A COPY to vdkirova@gmail.com! Always use as a subject “IS-663” plus any details you would like to add.

Mailing Address:
 Dr. Vassilka Kirova
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 NJIT, University Heights
 Newark, NJ 07102

| Part III: Mapping Learning Outcomes to Course Assessment | |
|---|---|
| Course Learning Outcome | Measure (i.e., exam, homework, rubric) |
| Good understanding of classical and modern lifecycle models, including agile methods | In class and online discussions; team project |
| Hands on analysis and specification skills, using methods such as use cases, scenarios, user stories and Product Backlogs | Team project; final exam |
| Good understanding of project management functions, including risk analysis in organizational, global and collaborative projects | Team project |
| Practical knowledge of estimation techniques | Team project; in class exercises |
| Understanding of architecture and design activities as well as the impact an opportunity provided by modern architectures and infrastructures such as cloud computing and SOA | Individual assignment, based on literature analysis; in class and online discussion |
| Hands on modeling skills (UML, agile UML) | Final exam |
| Understanding the fundamentals of Quality Assurances and quality frameworks | In class and online discussion; team project |

| Part IV: Course Outline (Note: this course outline is preliminary and subject to change) | | |
|---|--|---|
| Week | Lecture/Activity/Discussion | Reading (preliminary) <i>Check Moodle for additional reading every week</i> |
| Week 1 Jan. 22 | <p>Course logistics and introductions Course introduction – topics, objectives, SAD/SE state of the art, gaps, industry focus and ongoing research</p> <p>Reading: 1st reading assigned</p> <p>Forming Groups for Course Project: teams formed; discussions about topics initiated</p> | <p>Text Book: CH 1 Section 1.2: Software Engineering Ethics</p> <p>Required reading for discussion: "Software Chronic Crisis." W. Wayt Gibbs, Scientific American, September 1994, pp. 86-95.</p> <p>Supporting reading - The Dimensions of Software Engineering Success (see Moodle for details)</p> <p>General SE information: SIGSOFT Web: http://www.sigsoft.org/ Guide to Software Engineering Body of Knowledge (SWEBOOK Guide) - https://www.computer.org/web/swebok/index</p> |
| Week 2 | <p>Process models: fundamentals</p> <p>Review of traditional process models, comparative analysis</p> <p>Project start:</p> <ol style="list-style-type: none"> 1) All groups finalized 2) Teams work together to select topic and identify project's key contributions 3) Project proposal posted on Moodle <p>Discussion: Evolution of software development practices; review of week's one reading (paper 1 "Software Chronic Crisis") – Is there really a crisis today?</p> | <p>Text Book: CH 2</p> <p>Required reading (online discussion): "No Silver Bullet: Essence and Accidents of Software Engineering," Frederick P. Brooks, Jr, 1987, Brooks87.pdf</p> <p>RUP: A Rational Development Process, Philippe Kruchten, Crosstalk, 9 (7) July 1996, pp.11-16.</p> |
| Week 3 | <p>Iterative-incremental process models – RUP and Scrum - comparative analysis (cont.)</p> <p>Project:</p> <ol style="list-style-type: none"> 1) Discussion and approval of project topics 2) Market and competitors research <p>In class discussion – projects</p> <p>Discussion (online): "No Silver Bullet" by Fred Brooks</p> | <p>Text Book: CH 2, 3</p> <p>Scrum Guides: http://www.scrum.org/Scrum-Guides</p> <p>Key Scrum Concepts: http://www.scrumalliance.org/pages/what_is_scrum</p> <p>Lean Software Development: A Tutorial, IEEE Software, Volume 29, Number 5 (September/October 2012) – see Moodle</p> |
| Week 4 | <p>Product backlogs (PBL) and agile estimation</p> <p>Project meetings- Progress review</p> | <p>Product Backlogs (PBLs) and user stories (US) tutorials and examples, Mike Cohn, Scrum Alliance: http://www.mountaingoatsoftware.com/agile/user-stories</p> <p>http://www.scrumalliance.org/community/spotlight/mike-cohn/january-2014/keeping-the-user-in-user-stories</p> |
| Week 5 | <p>Requirements engineering: concepts, methods and standards</p> <p>Use Case models User Stories</p> <p>Discussion: RUP, Scrum, agile principles</p> | <p>Text Book: CH 4</p> <p>Alistair Cockburn's Use Cases Reference Page: http://alistair.cockburn.us/Use+cases</p> <p>Writing Effective Use Cases (see book extract- Chapter 1)</p> |

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| | | <p>"Structuring Use Cases with Goals" & Use Case Fundamentals, Alistair Cockburn</p> <p>UC Template</p> |
| Week 6 | <p>Project use cases review (all teams, in class discussion)</p> <p>Nonfunctional requirements</p> <p>Specifying the data aspects of requirements analysis (informal and BNF-based definitions)</p> <p>Project meetings Progress review</p> | Text Book: CH 4 |
| Week 7 | <p>Project management: planning, risk management, estimation</p> <p>Discussion: Large Scale Agile (tentative)</p> | Text Book: CH 22, 23 |
| Week 8 | <p>Architecture and design basics; software product lines; design quality.</p> <p>Project meetings Progress review</p> | <p>Text Book: CH 6, 7, 15, 18</p> <p>" Foundations for the Study of Software Architecture" , A. Wolf and D. Perry. Oct. 1992, ACM SIGSOFT Software Engineering Notes, 17:4 (The most cited software engineering paper for over a decade. The paper received the ACM SigSoft Retrospective Impact Award.)</p> |
| Week 9 | No class | Spring Recess |
| Week 10 | <p>Model-driven engineering: introduction to Object Oriented Analysis & Design (OOAD) concepts</p> <p>Exercises: Simple OOA models explained</p> <p>Project due date!</p> | <p>Text Book: CH 5, 7</p> <p>Introduction to Agile Modeling, Scott W. Ambler, 2005-2014 http://www.agilemodeling.com/essays/introductionToAM.htm</p> |
| Week 11 | Course project presentations! | <p>Project presentation guidelines and requirements will be provided on Moodle</p> <p>Online discussion: Current Best Practices (discussion on Moodle)</p> <p>Every student is expected to find a paper, survey or a classification discussing one or several current best practices and to provide an outline and references on Moodle. All students are expected to comment on at least 2 postings by other students.</p> |
| Week 12 | <p>Design heuristics and/or patterns - invited talk (1.5 hours)</p> <p>UML Summary</p> <p>Exercises: Modeling; CRC Cards</p> | <p>Text Book: CH 5, 6, 7</p> <p>Design Patterns (Dr. Dennis Mancl, DMTS, Alcatel-Lucent) – one more talk by the same presenters</p> |

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| | <p>Discussion: (TBD)</p> <p>Start of individual assignment 2</p> | <p>Forward Reading: The Case for Cloud Computing," R. Grossman, IEEE Software, March/April, 2009. (see Moodle)</p> |
| Week 13 | <p>Trends in software architecture, technology and delivery: DevOps, cloud, AI/ML, Security, etc.</p> <p>Online discussion: DevOps (see Moodle)</p> <p>Discussion: Project retrospectives, team work, best current practices</p> <p>Assignment 2 due date</p> | <p>Text Book: CH 6, 7, 15, 18</p> <p>Reading: TBP</p> |
| Week 14 | <p>Tentative: Quality Management Quality and continuous improvement frameworks (e.g., Lean Six Sigma, ISO 9000, CMMI, PSP, TSP, TQM, etc.)</p> <p>Course summary</p> <p>Discussion@Tentative): CMMI – is it still applicable? Course wrap-up and Q&A, Exam Preparation</p> | <p>Text Book: CH 24</p> <p>Reading (See Exam Preparation page in Moodle, for all papers, exercises and examples)</p> |
| Week 15 April 29 | <p>Final Exam (2 hours)</p> | |

Part V: Assignment Weighting (How Your Final Grade is Being Calculated?)

| Assessment Item | Percentage of final grade |
|---|--|
| Team Project | 40% |
| Individual Assignment | 10% |
| Final Exam (Comprehensive, closed book) | 50% |
| Extra Credits | Accumulated separately for active participation in class discussions, Moodle-based discussions, moderation, etc. |

Grade policy (approximate): A (95%-100%), B+ (85%-94.9%), B (75%-84.9%)

Part VI: Delivery Mechanism

The following delivery mechanisms will be utilized:

- Face-to-face lectures
- Moodle: <http://moodle.njit.edu>
- NJIT on iTunes U: <http://itunes.njit.edu>
- Online resources (other than iTunes):
- Other (see below):

Part VII: Plagiarism and Academic Integrity

The approved "[University Code on Academic Integrity](#)" is currently in effect for all courses. Should a student fail a course due to a violation of academic integrity, they will be assigned the grade of "XF" rather than the "F" and this designation will remain permanently on their transcript.

All students are encouraged to look over the [University Code on Academic Integrity](#) and understand this document. Students are expected to uphold the integrity of this institution by reporting any violation of academic integrity. The identity of the student filing the report will be kept anonymous.

NJIT will continue to educate top tier students that are academically sound and are self-disciplined to uphold expected standards of professional integrity. **Academic dishonesty will not be tolerated at this institution.**

Part VIII: Getting Help - General

The IST Helpdesk is the central hub for all information related to computing technologies at NJIT. This includes being the first point of contact for those with computing questions or problems.

There are three ways to contact the Helpdesk:

1. Call 973-596-2900. Monday - Friday 8 am - 7 pm.
2. Go to Student Mall Room 48. Monday - Friday 8 am - 7 pm
3. Log a Help Desk Service Request online - <https://ist.njit.edu/support/contactus.php>.

Part IX: Getting Help - Moodle

In addition to the Helpdesk NJIT has a number of resources available to help you learn/use Moodle. Please be aware of the following:

1. Getting Started Using Moodle (Student Course): <http://njit.mrooms.net/course/view.php?id=6204>
2. Student Moodle Tutorials: <http://moodle.njit.edu/tutorials/students/index.php>
3. Student Moodle FAQs: <http://moodle.njit.edu/tutorials/students/faq.php>