

Course Outline

SENG 609 (Fall, 2009) – Theoretical Foundations of Software Engineering

Type: Q(3-0)

Instructor: Prof. Y. Wang (ICT542, Email: yingxu@ucalgary.ca)

Period: Oct. 21, 2009 – Dec. 2, 2009

Date: Wednesdays

Time: 5:30pm – 8:20pm

Classroom: ICT 516

Course website: <http://www.enel.ucalgary.ca/People/wangyx/Courses/SENG609.19.htm>

Description

Principles and constraints of software engineering (SE): Basic constraints of SE. Tackling SE constraints by fundamental principles; Transdisciplinary foundations of SE; Philosophical foundations of SE: Philosophies of science and engineering. Formal reasoning methodologies. SE philosophies; Engineering foundations of SE: Generic engineering principles for SE. The coordinative work organization theory for SE. Large-scale software project organization; Mathematical foundations of SE: Classic mathematics. Denotational mathematics. Real-time process algebra (RTPA); Concept algebra. Computational foundations of SE: Basic computation models. Data object modelling. Behavior modelling. Program modelling. SE resources and processes modelling; System Science Foundations of SE: System philosophies, system topology, system algebra, principles of system science, software system engineering; Cognitive Informatics foundations of SE: Classic and contemporary information theories. Cognitive informatics. Informatics laws of software. Cognitive complexity of software. Cognitive computing and SE.

Prerequisite: No

Evaluation

1. Assignments (x5): 30%
 - Hand in on Wednesdays following each previous lecture
 - Both electronic and hard copy submissions are required
2. Group presentations and discussions on assigned classic papers (x5): 20%
3. Quiz (x1): 20%
 - Final week, multiple choice questions, 30 min.
4. Final project report: 30%
 - >10 pages
 - Grades are based on originality, quality, background knowledge, and formal written styles
 - Only an electronic submission in Word format is required.

Recommended Textbooks

Y. Wang (2007), *Software Engineering Foundations: A Software Science Perspective*, CRC Series on SE, Vol. II, Auerbach Publications, NY, USA, 1,480pp.

M. Broy and E. Denert eds. (2001), *Software Pioneers: Contributions to Software Engineering*, Springer.

Theoretical Foundations of Software Engineering

Week	Date	Lecture	Assignment
1	Oct. 21	Lecture 1. Principles and Constraints of SE <ul style="list-style-type: none"> - Basic constraints for SE - Fundamental principles of SE - Tackling SE constraints by the principles - Transdisciplinary foundations of SE 	Ex.1.1 Ex.1.2 Classic literature review (1) – Edsger W. Dijkstra
2	Oct. 28	Lecture 2. Philosophical & Engineering Foundations of SE <ul style="list-style-type: none"> - Philosophies of science and engineering - SE philosophies - Generic engineering principles for SE - The coordinative work organization theory for SE - Large-scale software project organization 	Ex.2.1 Ex.2.2 Classic literature review (2) - Fredrick P. Brooks
3	Nov. 4	Lecture 3. Mathematical Foundations of SE <ul style="list-style-type: none"> - Classic mathematics for SE - Denotational mathematics for SE - Real-time process algebra (RTPA) - The RTPA methodology for SE - Concept algebra 	Ex.3.1 Ex.3.2 Classic literature review (3) – Juris Hartmanis
4	Nov. 18	Lecture 4. Computational Foundations of SE <ul style="list-style-type: none"> - Basic computation models - Data object modeling and manipulations - Behavioral modeling and manipulations - Program modeling and manipulations - SE resources and process modeling and manipulations 	Ex.4.1 Ex.4.2 Classic literature review (4) – David L. Parnas
5	Nov. 25	Lecture 5. System Science Foundations of SE <ul style="list-style-type: none"> - System philosophies - System topology - System algebra - Principles of system science - Software system engineering 	Ex.5.1 Ex.5.2 Classic literature review (5) – C.A.R. Hoare
6	Dec. 2	Lecture 6. Cognitive Informatics Foundations of SE <ul style="list-style-type: none"> - From classic and modern information theories to cognitive informatics - Information properties of software - Cognitive informatics laws of SE - Cognitive complexity of software - Cognitive computing and SE 	Quiz (30 min); Requirement description for the final project report
	Dec. 14	-	Final project report due