Course: PROGRAMMING PARADIGMS AND LANGUAGES (CSc 600)

Instructor: Dr. Jozo Dujmović (English spelling/pronunciation: Yozo Dooy-mo-vich)
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Prerequisite: Grade of C or better in CSc 413 and (starting in Spring 2021) in CSc 510. Strict enforcement, no exceptions.

Requested: 1. J. Dujmović, ***Programming Paradigms and Languages.*** (600 Reader). Fourth Edition, SFSU, 2020.

Recommended literature:

1. A.B. Webber, *Modern Programming Languages: A Practical Introduction*. Franklin, Beedle &Asso. 2nd ed. 2011. http://www.webber-labs.com/mpl.html (downloadable ppt lectures) (a textbook for this class)
2. A.B. Tucker and R.E. Noonan, *Programming languages*. Second Edition. McGraw-Hill, 2007.
3. K.C. Louden, *Programming Languages, Principles and Practice.* Second Edition. Thomson 2003.
4. G. Springer and D.P. Friedman, *Scheme and the Art of Programming.* The MIT Press/McGraw-Hill, 1989.
5. D. Thomas, C. Fowler, A. Hunt, *Programming Ruby 1.9.* Pragmatic Programmers, 2009.

On-line: All communication with the class, HW, exams, administration of grades, and distribution of educational materials is based on iLearn. iLearn also includes a more detailed list of literature, including free books)

Goals: Learn programing paradigms, develop respectful and tolerant approach to various programming languages, learn to always recognize and support components of software quality, develop critical thinking in the software area, and prepare for a long professional life in a permanently changing computational problem solving area. After completing CSc 600 students can write in their resumes "***I am familiar with SW development using procedural, logic, functional and object-oriented programming paradigms***."

Contents:

1. **Syntax and semantics of programming languages**. BNF, EBNF, syntax diagrams, and parenthetic notation. Syntax errors and semantic errors. Interaction of syntax and semantics.
2. **Procedural programming paradigm**. Basic data types and data formats. Concepts of imperative languages. Procedural vs. nonprocedural programming style. Study of software performance problems. Avoiding brute force programs. Program performance measurement. Efficient use of **C/C++**.
3. **Logic programming paradigm**: Concepts of declarative programming. Logic programming and nonprocedural problem solving using **Prolog.** Facts, rules, and the operation of Prolog inference engine.
4. **Functional programming paradigm**. Concepts of first class objects. Functional programming style and recursive problem solving using **Scheme** or **Racket.** Anonymous functions and functions that return functions.
5. **Object oriented programming paradigm**. Concepts of multiparadigm languages. OO programming and problem solving using **Ruby**. Design and implementation of interpreters and virtual machines (optional).

Grading: Segments 1 and 2 are covered by the multi-part homework HW1 and Midterm MT1. Segment 3 is covered by HW2 and MT2. Segments 4 and 5 are covered by HW3.S/R and the final exam FE. All grade points are in the range from -50 to 100% (-50 is assigned to not submitted HW and illegal work on exams). The total class points are **P=0.04*HW1+0.04*HW2+0.04*HW3+0.28*MT1+0.2*MT2+0.4*FE**. In order to pass this class, each of five segments must have a positive grade. The final letter grades and passing decisions significantly depend on the final ranking in the class and the presence of segments that are graded close to the failing level For detailed description of grading process see the FAQ file on iLearn. CSc 600 is not a prerequisite for other classes, and consequently the minimum acceptable passing grade is D-.

Attendance: The attendance of lectures is mandatory and randomly checked.

Homework: HW is mandatory, designed to develop programming skills in various languages and to prepare for exams. It is highly unlikely that students who individually solve all HW can get the CSc 600 grade lower than B+.

Exams: Online exams are open books/notes. All work must be individual. Cheating of any kind yields -50 pts.

Effort: Approximately **1-2 hours of work every day** during the semester. Do not enroll in 600 if your schedule does not provide at least 1 hour for 600 work each day. CSc 600 is the last mandatory programming class and it assumes programming maturity. You have to quickly learn three new and very different languages and write programs using language processors that you have to download and install in your machines. ***Do not take 600 in your last semester and do not take it in parallel with more than 2 other CSc classes.***

Copyright: All material used and distributed in the course, including all homework and exams, is copyrighted. Its unauthorized redistribution and/or posting on the Internet are piracy that is illegal and prohibited.

Smartphones: The use of smartphones (or the use of computers for email and similar activities) during the face-to-face lectures is rude, disturbs the instructor, and will not be tolerated in CSc 600.

Addendum: According to SFSU Academic Senate Policy S15-257, all students are requested to read the Addendum to Course Syllabi posted on iLearn next to the Syllabus. The Addendum specifies disability access, and student disclosures of sexual violence.