Name of the Programme : **M.Sc. Data Science**
Course Code : **CSD-604**
Title of the Course : **Programming Paradigms**
Number of Credits : **4 (4L-0T-0P)**
Contact hours : **60 hours**
Effective from AY : **2023-24**

Prerequisites for the course	Knowledge of programming	
Course Objectives	To learn, understand and apply the various programming paradigms when writing programs.	
Content	**Understanding Programming Paradigm** 1. Concept, motivation, types and classification 2. Factors affecting programming languages **Imperative Programming** 1. Concepts, Constructs 2. Procedural (in Python/C) 3. Object Oriented (*in Java/C++*)	**15 hours**
	Functional Programming (*in Haskell/Clojure/Scala*) 1. Mathematical functions 2. Side effects; Currying 3. Declare/define functions; composition 4. Recursion, Lazy evaluation 5. Lists; Higher order functions; Folds	**15 hours**
	Logic Programming (*in Prolog/ECLiPSe Constraint language*) 1. Mathematical logic 2. Logic programming with facts, rules and goals 3. Constraint logic programming; constraints as relationship between variables; solving puzzles **Event-driven Programming** (*in Python/.NET*) 1. Events; Handlers; Callback 2. Scheduler; Triggers 3. Reliable eventing; Asynchronous triggers	**15 hours**
	Parallel Programming 1. Shared programming (*in OpenMP*) 2. Distributed programming (*in MPI*) 3. MPI with CUDA **Multi-Paradigms** 1. Language support for multi paradigms 2. Reactive programming (*in Elm/ReactiveX*) 3. Meta programming (*in Lisp*) 4. Natural Language Programming (*in SciLab/MATLAB*)	**15 hours**
Pedagogy	Lectures/ Tutorials/Hands-on assignments/ Self-study/ Flipped classroom	

References/ Readings	1. Allen Tucker, Robert Noonan, "Programming Languages: Principles and Paradigms" 2. Bruce J. Mac Lennan, "Principles of Programming Languages: Design, Evaluation, and Implementation" 3. Graham Hutton, "Programming in Haskell" 4. Kenneth C. Louden, "Programming Languages: Principles and Practice" 5. Ravi Sethi, "Programming Languages Concepts & Constructs" 6. Robert L. Sebesta, "Concepts of Programming Languages" 7. Roland Kuhn, Brian Hanafee, Jamie Allen, "Reactive Design Patterns" 8. Slim Abdennadher, Thom Frühwirth, "Essentials of Constraint Programming" 9. Terrance W. Pratt, Marvin V. Zelkowitz, "Programming Languages - Design & Implementation" 10. W. Clocksin, "Programming in Prolog"
Course Outcomes	1. Learner will be able to distinguish between different programming paradigms, and expand the understand of popular paradigms 2. Learner will be able to decide and understand the need for functional programming based on sound mathematical principles 3. Learner will be able to write logic based decision programs, and also event-driven programs 4. Learner will be able to program on varied hardware/infrastructure platforms, and combine multiple paradigms to suit the requirements

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