City University

Department of Computer Science and Engineering
Faculty of Science and Engineering

Course Outline

Course Code and Title, CSE – 418: Artificial Intelligence Laboratory
Credit Hours: 1.5
Prerequisites: CSE 114, CSE 214

Program: B. Sc. in Computer Science & Engineering (CSE),
Semester: Spring 2019
Total Weeks: 13 **Hours/Week:** 3 **Total Hours:** 39^{+}

Instructor: Supta Richard Philip
Designation: Senior Lecturer
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Office Hrs: By appointment

Course Details
Rationale:
Prolog (programming in logic) is one of the most widely used programming languages in artificial intelligence research. As opposed to imperative languages such as C or Java (the latter of which also happens to be object-oriented) it is a declarative programming language. Prolog is very useful in some problem areas, such as artificial intelligence, natural language e processing, databases etc, but pretty useless in others, such as graphics or numerical algorithms. The aim of this course is to introduce programming in the Prolog language. Prolog encourages a different programming style to Java or ML and particular focus is placed on programming to solve real problems that are suited to this style. Practical experimentation with the language is strongly encouraged.

Course Objectives:

1. Learn how to use Prolog as a programming language to solve practical problems in computer science and artificial intelligence.
2. Explain the differences between the declarative and procedural programming paradigms, discuss the potential applications of the Prolog programming language, identify its strengths and weaknesses, and interpret the syntax and semantics of Prolog's core concepts.
3. Learn logical foundations of the Prolog language.
4. be able to write programs in Prolog using techniques such as accumulators and difference structures;
5. know how to model the backtracking behavior of program execution;
6. appreciate the unique perspective Prolog gives to problem solving and algorithm design;
7. Understand how larger programs can be created using the basic programming techniques used in this course.

Intended learning outcomes (ILOs) of the Course:

Knowledge	**LO1:** Knowledge of logic programming language associated with artificial intelligence and computational linguistics.
	LO2: Explain the role and place of PROLOG in the area of Artificial Intelligence (AI), and in programming-language research more in general.
	LO3: Use PROLOG and Python as an effective AI programming tool.
	LO4: Develop and test Prolog programs using a suitable Prolog interpreter.
Skills	Will develop skills on understanding the problems
	Will gain skills on analysis the problem and selecting the solutions for the problem.
	Will help in achieving communication, demonstrate and presentation skill.
Attitude	Will develop attitude to group dynamics and team work.
	Will create attitude to tackle challenges related to computer and basic software.
	Will create positive attitude to listen ideas of classmates.

Mapping of Course ILO and PLO:

Learning Outcome (LO) of the Course	Program Learning Outcome (PLO)											
	1	2	3	4	5	6	7	8	9	10	11	12
ILO1	MJ	MN										
ILO2	MJ	MJ	MJ	MJ					MN			
ILO3		MJ	MJ	MJ	MJ							
ILO4		MJ	MJ		MJ							

Course Contents:

SL No	ILO	Topic	Teaching Strategy	Assessment Strategy	No of Sessions
1.	1	Programming Paradigms and Logic Programming, Meaning of Prolog Programs, Symbol manipulation, Characteristics of PROLOG, PROLOG under Windows and Unix.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
2.	1,2	Prolog Syntax; Atoms, Numbers, Complex terms, Unification, Logic variables, Substitution, Resolution (the execution mechanism of Prolog).	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
3.	1,2	Matching and Proof Search: Matching occurs check, Programming with matching Proof Search.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
4.	2,3	Recursion: Recursive definitions, Clause ordering, goal ordering, and termination.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
5.	2,3,	Input-Output Predicates, Assert and Retract	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
6.	2,3,	Arithmetic: Structures, Arithmetic in Prolog, Comparing integers.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report, Quiz	02
7.	2,3,4	Lists: List, Member, Recursion down list, Arithmetic and lists, list processing; Operators, Append, Reversing List.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
8.	3,4	String Processing, Tuples.	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	03
9.	3,4	Cut, Negation as Failure, Built-in Procedures	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report	02
10.	3,4	Controlling Backtracking, Database Manipulation, Practical Applications	Lecture, Demonstration,	Q/A, Skills Evaluation, Lab Report, Quiz	02
		Total			21

Teaching Learning Methods:

Analyze and solve knowledge-based problems for practical situation
Group discussion
Lecture slides, presentations, audio and video
Analytical and critical thinking approach to understand real life system and models

Assessment Schedule:

Assessment 1	Quizzes	Week 4, Week 10
Assessment 2	Assignments	Week 5, Week 11
Assessment 3	Presentation	Week 5, Week 11
Assessment 4	Mid-Term Exam	Week 6
Assessment 5	Final Exam	Week 12

Weights of Assessments:

Assessments	%
Mid-Term Exam	30
Final Exam	40
Quizzes	10
Assignments	10
Presentation	10
Total	**100**

Grading Policy:

Policy	Letter Grade	Grade Point	Assessments
80% and above	A+	4.00	Outstanding
75% to below 80%	A	3.75	Superlative
70% to below 75%	A-	3.50	Excellent
65% to below 70%	B+	3.25	Very Good
60% to below 65%	B	3.00	Good
55% to below 60%	B-	2.75	Average
50% to below 55%	C+	2.50	Below Average
45% to below 50%	C	2.25	Passing
40% to below 45%	D	2.00	Probationary
Below 40%	F	-----	Fail

List of References:

Course Notes: Follow Lecture notes

Essential Books (Text Books):

1. Patrick Blackburn, Johan Bos, Kristina Striegnitz. Learn Prolog Now

Recommended Reference Books:

1. Ivan Bratko, Prolog-Programming for Artificial Intelligence, 3rd Edition, Addison Wesley, 2001.
2. William F. Clocksin, Christopher S. Mellish-Programming in Prolog.

Online Recourses: Use Internet to get documents on specific topics.

Facilities Required for Teaching and Learning:

Projector, Whiteboard, Internet access from classroom computer, Audio/Visual equipment.

Course Policies and Procedures:

1. **Class attendance:** Regular attendances of classes are mandatory and students will be assigned F automatically if he/she misses 6 consecutive classes.
2. **Late submission of work:** Late submission will be followed by penalty, please maintain deadlines.
3. **Unfair means /plagiarism:** Plagiarism will be dealt with severe penalty. Original work is encouraged as they will carry value marks.

Appendix-1: Program Learning Outcome (PLO)

PLO No.	PLO
1.	Engineering Knowledge
2.	Problem Analysis
3.	Design/Development of Solutions
4.	Investigation
5.	Modern Tool Usage
6.	The Engineer and Society
7.	Environment and Sustainability
8.	Ethics
9.	Communication
10.	Individual and Team Work
11.	Life Long Learning
12.	Project Management and Finance

Professional/Generic Skills (Detailed):

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics (ESSE)** –Apply professional ethics with moral values and commit to responsibilities and norms of professional engineering code of practices.
9. **Communication (S)** -Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

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Course Coordinator/ Teacher *Head of the Department*

Date: *Date:*