

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY OF DELHI

DELHI - 110 007

TIME - TABLE FOR PRE-PHD COURSE WORK

	9 - 10	10 - 11	11 - 12	12 - 1	1 - 2	2 - 3	3 - 4	4 - 5
				NG		AS	NKS	
MONDAY				FCS		RPE	RPE	
				TH		TH	TH	
			AR				HK	
TUESDAY			FCS				RPE	
			TH				TH	
			AS	AS	NKS	NKS		
WEDNESDAY			RM	RM	ML	ML		
			HK	HK	YM			
THURSDAY			ML	ML	FCS			
					TH			
			HK	HK				
FRIDAY			RM	RM				
	NKS	NKS	AS	AS				
SATURDAY	RM	RM	ML	ML				

FCS

Prof. Neelima Gupta (NG)

Dr. Ankit Rajpal (AR)

Dr. Yogendra Meena (YM)

RPE

Dr. Archana Singhal (AS)

Dr. Neeraj Kumar Sharma (NKS)

Dr. Harmeet Kaur (HK)

RM

Dr. Archana Singhal (AS)

Dr. Neeraj Kumar Sharma (NKS)

Dr. Harmeet Kaur (HK)

ML

Dr. Archana Singhal (AS)

Dr. Neeraj Kumar Sharma (NKS)

Dr. Harmeet Kaur (HK)

## **RCS001 - RESEARCH METHODOLOGY**

*Dr. Neeraj Kumar Sharma (14 hrs)*

- The literature review: Importance of the literature review, Planning a literature search, Locating relevant literature, Reliability of a source, Note making, Writing a survey and identifying the problem. Planning and writing a research proposal: Research projects, Finding a research problem, and Analysis of research ideas. Planning a proposal: Some general considerations, Proposal outline, Presentation and evaluation of proposals, Students' outline of research work, Major funding agencies.
- Ethics and related issues in research: Concepts in ethics, Intellectual Property Rights, Plagiarism, Fraud and misconduct in science, Unscientific practices in thesis work. Meetings, Presentations and lectures: Scientific meetings, General features of a Scientific conference, Planning and delivering a presentation, Preparing good presentation slides, Poster presentation in meeting, Students' seminar, Group and panel discussion, Academic lectures.

*Dr. Archana Singhal and Dr. Harmeet Kaur (13 hrs + 13hrs)*

- Collection and analysis of data: Designing experiments for the purpose of testing research hypotheses, and evaluating the results of those experiments, Analysis of data, Descriptive statistics, Inferential Statistics. Some common statistical tests, Monitoring research, Records to be maintained by researchers, hypothesis testing and inferences. Tables and illustrations: Making of a table, Arrangement of data in tables, Illustrations, Graphs and visualization.
- Information sources: Tools for identifying literature, Types of publications, Indexing and abstracting services, online library, Search engines, Citation indexes, Citations analysis, online searching methods, initiatives for knowledge management. References: How to cite and list correctly, Why citation of source materials is important, Citation and listing system of documents, Common documentation styles, Citation of sources in the text, Examples of writing references, Electronic and on line Sources, Some worked out examples for the prominent styles, Reference management softwares, Selecting a journal, conference.
- Scientific writing: Use of paragraphs and sentence checking. Abbreviations: Care with numerals, SI unit rules and style conventions. Titles, Verbs, Tenses, The active or passive voice, 'articles', Prepositions, Relative pronouns, Transitional words and phrases, Economy in words, Singular and plural words, Commonly confused words, Choosing correct words and phrases, Punctuation. Preparation of thesis and research papers: Structure of a thesis/research article/ review article, including title, introduction, literature review, methods and materials, referencing. Editing and proofreading, use of abbreviations.

## **Research and Publication Ethics (RPE)**

*Dr. Neeraj Kumar Sharma (8 Hrs)*

- Philosophy of Ethics
- Scientific Conduct

*Dr. Archana Singhal (11 Hrs)*

- Publishing ethics Ethics
- Open Access Publishing

*Dr. Harmeet Kaur (11 Hrs)*

- Publication misconduct
- Databases of Research Metrics

## **RCS002 – FOUNDATION OF COMPUTER SCIENCE**

### ***Prof. Neelima Gupta***

- Algorithms: Review of Analysis of Searching, Sorting, Graph Algorithms. Recursion via Greedy Approach and Dynamic Programming. String Matching Algorithms: KMP, Tries Network Flows: Ford and Fulkerson Algorithm. Introduction to Hardness: NP-Complete Class via Clustering and Resource Allocation, Linear Program Vs Integer Programs Introduction to techniques of solving hard problems via Clustering and Resource Allocation: Simple Approximations and Heuristics.

### ***Dr. Ankit Rajpal***

- Programming Module Syllabus: Type Conversion and casting: automatic conversion and automatic promotion in a language, promotion rules. Implementation of dynamic data structures, File handling, and exception handling (handling built-in and user defined exceptions), user input through command line arguments, string handling, generic classes and generic functions.

### ***Dr. Yogendra Meena***

- Data Structures: Review of basic data structures: stacks, queues, lists (sequential vs linked implementation), trees, and graphs. File-based implementation of B-tree.

## **RCS023 - MACHINE LEARNING**

### ***Dr. Neeraj Kumar Sharma***

- Introduction To Machine Learning: Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier, Decision Trees.
- Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.
- Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables, Optimization, Decision Trees vs Logistic Regression

### ***Dr. Archana Singhal***

- Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Back-propagation Algorithm and related Issues.
- Introduction to Clustering, K-Means Algorithm, Random Initialization, Choosing the number of Clusters, Mixture Models, Dimensionality Reduction and its application, Principal Component Analysis (PCA).

### ***Dr. Harmeet Kaur***

- Support Vector Machines: Knowing SVMs, SVM as Large Margin Classifier, Kernels, Using SVMs in Learning complex non-linear functions, Constrained Optimization, SVM utilization.
- Error Analysis and Anomaly Detection: Utility of Error Analysis, Precision/Recall, Error Metrics for Skewed Classes, Introduction of Anomaly Detection, Gaussian Distribution, Anomaly Detection vs. Supervised Learning.