SEMESTER-1
Paper-611
(Pattern Recognition and Applications)
Theory-Compulsory
Marks: 80+20 (Credits: 4)

Pattern Recognition and Applications

UNIT I

Pattern Recognition – Definitions, Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Feature extraction and Pattern Representation. Metric and non-metric proximity measures, classification vs. regression, Concept of Supervised and Unsupervised Classification. Image processing basic: What are images, acquisition, type, point operations, Geometric transformation, and Feature extraction from image. Image Enhancement, binarization, segmentation. Morphological Image processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT II

Statistical Pattern Recognition: Bayes Decision Theory, Minimum Error and Minimum Risk Classifiers, Discriminant Function and Decision Boundary, Normal Density, Discriminant Function for Discrete Features.
Nearest Neighbour Classifier, k-nearest neighbour.

UNIT III

Dimensionality Problem: Dimension and accuracy, Computational Complexity, Dimensionality Reduction, dimension reduction using PCA.
Association Rule Mining: Motivation and terminology, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis.
Decision tree: Introduction, decision tree from training examples, entropy, ID3 algorithm criterion, over fitting.

UNIT IV

Clustering: Basic issues in clustering, First conceptual clustering system: Partitioning methods: k-means, expectation maximization (EM), Hierarchical methods: distance-based agglomerative and divisible clustering.
Overview of Big Data, distributed file system– Big Data and its importance, Four Vs.
Applications of pattern recognition: handwritten character recognition, Face recognition system.
References:

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad
2. R.O. Duda, P.E. Hart and D.G. Stork, Pattern Classification, John Wiley, 2001.
3. C Bishop – Pattern Recognition and Machine Learning – Springer, 2006.

4. Frank J. Ohlhorst, Big Data Analytics, 1st Edition, Wiley, 2012
5. S Sridhar, "Digital Image Processing", Oxford University Press.
6. Rafel C. Gonzalez and Richard E. Woods, "Digital Image Processing using Matlab", Pearson Education.

SEMESTER-1
Paper-612
(Research Methodoloy-I)
Theory-Compulsory
Marks: 80+20 (Credits: 4)

UNIT-I: SCOPE OF RESEARCH AND ETHICS:

Introduction and Scope
Research problem: Identification, Selection, Formulation of research objectives.
Research design: Components, Types and Importance
Research ethics, Institutional ethics committee
Plagiarism-Pitfall.

UNIT-II: Technical Writing:

Types of technical documents; Full length research paper, Short/Brief communications, Letters to editor, Book chapter, Review, Conference report, Project proposal.

Components of a full length research paper; Title/ Topic statement, Abstract/key words, Aims and objectives, Hypothesis building, Rationale of the paper, Work plan, Materials and methodology, Results and discussion, Key issue and arguments, Acknowledgement, Conflict of interest statement, bibliography, Technical Resumes & Cover Letters.

Components of a research proposal; Project summary Key words, Origin of the proposal, Major Objectives Methodology, Instrument facility available in the PI's department, Overview of status of Research and Development in the subject, Importance of the proposed project in the context of current status, Bibliography.

UNIT–III: SCIENTOMETRICS

How to cite and how to do referencing
Literature search technique, using SCOPUS, Google Scholar
PUBMED, Web of Science, Indian Citation Index, and RG
Styles of referencing; APA,MLA, Oxford, Harvard, Chicago
Annotated bibliography
Tools for citing and referencing, Grammarly, Endnote etc

UNIT –IV: PRESENTATION AND COMMUNICATION SKILLS

Tables, Figures and Pictures using Excel PowerPoint
Slide preparation
Preparation of Posters
Electronic submission of manuscripts
Communication skills, oral and poster

SEMESTER –I
Paper–613
(Research Methodology -II)
Theory –Compulsory
Marks –80 + 20 (4 CH)

UNIT –I: IPR AND CYBER LAW

Patents
Patent laws, process of patenting a research finding
Intellectual property (IP), Intellectual property right (IPR)
Copyright, Trademarks, GI
Cyber laws
COPE

UNIT –II: QUANTITATIVE DATA ANALYSES

Types of data, Data collection -Methods and Tools
Hypothesis testing
Normal and Binomial distributions and their property
Tests of significance: Student t-test, F-test, Chi-square test
Correlation and Regression
ANOVA -One-way and Two-way, Multiple-range test

UNIT –III: COMPUTER FUNDAMENTALS

Introduction to MS-Office software: MS-Word (Track change)
MS-Excel
MS-Power Point
MS-Access
Features for Statistical data analysis using computers and software
Microsoft Excel Data Analysis Tool Pak, SPSS

UNIT –IV: ADVANCED TOOLS & TECHNIQUES

Python: Basic syntax, interactive shell, editing, saving, and running a script. data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions. Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

Image Processing using OpenCV and Python

SEMESTER –I
Paper –614
Marks –100 (4 CH)

TEACHING ASSIGNMENT

SEMESTER –II
Paper –621
Marks–150+ 25+25 (8 CH)

DISSERTATION

(Thesis + Seminar Presentation of the Thesis + Viva –Voce)