GOVERNMENT COLLEGE OF ENGINEERING AURANGABAD
"*In Pursuit of Global Competitiveness*"
(An Autonomous Institute of Government of Maharashtra)
Department of Information Technology

Bachelor of Technology in Information Technology
Class BEIT : With Effect From 2021-2022

Program Educational Objective(s) After graduation and few years of graduation, the (Information Technology) graduates would	
PEO I	Interpret, design and analyze data for effective problem solving
PEO II	Pursue advanced studies to adapt to current trends
PEO III	Attain professional careers and provide services in societal and environmental context for sustainable development
PEO IV	Work successfully with effective communication skills, professionalism, team work and ethical attitude

Program Outcome(s)

The program enables students to achieve by the time of graduation:

1. An ability to apply principles and methodologies of mathematics, science, and engineering fundamentals
2. An ability to identify, study research literature, formulate the computing requirements appropriate to its solution
3. An ability to design solutions for engineering problems and design systems or processes that meet specified needs with appropriate considerations
4. An ability to conduct investigations of complex problems including design of experiments, analysis and interpretation of data to provide valid conclusions
5. An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools with an understanding of the limitations
6. An understanding of professional engineering practice with concern to societal, health, safety and legal responsibilities
7. Recognize the impact of IT solutions in an environmental and societal context and demonstrate knowledge of and need for sustainable development
8. Understand and commit to professional ethics and responsibilities and norms of engineering practice
9. An ability to function effectively as an individual and as a member or leader in a team to accomplish a common goal
10. Communicate effectively to comprehend and write effective reports, design documentation and make effective presentations
11. An ability to engage in independent and life-long learning to enhance their careers for continuing professional development
12. An understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects

Mapping of PEOs and POs

Programme Educational Objective(s)	Program Outcome(s)	
PEO I	Interpret, design and analyze data for effective problem solving	1,2,3
PEO II	Pursue advanced studies to adapt to current trends	3,4,5,6,7,9
PEO III	Attain professional careers and provide services in societal and environmental context for sustainable development	4,5,6,7,8,9,10,11,12
PEO IV	Work successfully with effective communication skills, professionalism, team work and ethical attitude	6,8,10,11,12

Final Year Engineering (IT) Choice Based Credit System
Semester- VII

			Contact Period (Hrs.)				Continuous Evaluation in terms of Marks						
Sr No	**Subject Code**	**Subject**	**TH**	**T**	**PR**	**Credits**	**Class Test I**	**Class Test II**	**TA**	**ESE**	**TW**	**Practical/Viva-voce**	**Total (100)**
1	IT4056	Data Mining	3	-	-	3	15	15	10	60	-		100
2	IT4057	Image Processing	3	-	-	3	15	15	10	60	-		100
3	IT4058	Cloud Computing	3	-	-	3	15	15	10	60	-		100
4	IT 4078 IT4080	**Professional Elective – III** Compiler Construction Soft Computing	4	-	-	4	15	15	10	60	-		100
5	OEIT4001	**Open Elective** Machine Learning	3	-	-	3	15	15	10	60	-		100
6	IT4059	Lab: Data Mining	-	-	2	1	-	-	-		25	25	50
7	IT4060	Lab: Image Processing	-	-	2	1	-	-	-		25	25	50
8	IT4061	Lab: Cloud Computing	-	-	2	1					25	25	50
9	IT4079 IT4081	**Lab: Professional Elective – III** Lab: Compiler Construction Lab: Soft Computing	-	-	2	1	-	-	-		25	-	25
10	IT4062	Project Part I	-	-	4	2	-	-	-		50	25	75
Total			**16**	**0**	**12**	**22**	**75**	**75**	**50**	**300**	**150**	**100**	**750**

Final Year Engineering (IT) Choice Based Credit System
Semester- VIII

			Contact Period (Hrs.)				Continuous Evaluation in terms of Marks						
Sr No	**Subject Code**	**Subject**	**TH**	**T**	**PR**	**Credits**	**Class Test I**	**Class Test II**	**TA**	**ESE**	**TW**	**Practical/ Viva-voce**	**Total (100)**
1	IT4064	Cryptography and Network Security	3	-	-	3	15	15	10	60	-		100
2	IT4065	Internet of Things	3	-	-	3	15	15	10	60	-		100
3	IT4084 IT4085	**Professional Elective – IV** Information Retrieval Geographical Information System	4	-	-	4	15	15	10	60	-		100
4	OEIT4002	**Open Elective** Big Data & Analytics	3	-	-	3	15	15	10	60	-		100
5	IT4066	Lab: Cryptography and Network Security	-	-	2	1	-	-	-		50	25	75
6	IT4067	Lab: Internet of Things	-	-	2	1	-	-	-		50	25	75
7	IT4086 IT4087	**Professional Elective – IV** Lab: Information Retrieval Lab: Geographical Information System	-	-	2	1	-	-	-		25	25	50
8	IT4068	Project Part-II	-	-	12	6	-	-	-		50	100	150
		Total	**13**	**00**	**18**	**22**	**60**	**60**	**40**	**240**	**175**	**175**	**750**

IT 4056 : Data Mining

Teaching Scheme	Examination Scheme	
Lectures: 3Hrs/Week	Class Test-I	:15 Marks
Credits: 3	Class Test-II	:15 Marks
	Teachers Assessment	:10 Marks
	End Semester Exam	:60 Marks

Prerequisites: IT2039 Database Management System, IT3052 Advance Database Management Systems

Course Description: Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures. The course will cover all these issues and will illustrate the whole process by examples. Special emphasis will be give to the Machine Learning methods as they provide the real knowledge discovery tools.

Course Educational Objectives:

1. To introduce the basic concepts of Data Mining techniques
2 Examine the types of the data to be mined and apply preprocessing methods on raw data
3 Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms

Course Outcomes:

CO1 Process raw data to make it suitable for various data mining algorithms.
CO2 Discover and measure interesting patterns from different kinds of databases.
CO3 Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data
CO4 Determine whether a real world problem has a data mining solution

Detailed Syllabus

UNIT-1 **Introduction:** Introduction to Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.
Getting to know your data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.
Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT-2 **Mining Frequent Patterns, Associations and correlations**: Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods, Pattern Mining in Multilevel and multidimensional space

UNIT-3 **Classification:** Basic Concepts**,** Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting and AdaBoost.

Classification: Advanced Methods Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, LazyLearners (or Learning from Your Neighbors),

UNIT-4 **Cluster Analysis:** Basic Concepts and Methods, Overview of Basic Clustering Methods, Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees.

Density-Based Methods: DBSCAN: Density-Based Clustering Based on Connected Regions with High Density, OPTICS: Ordering Points to Identify the Clustering Structure, Grid-Based methods **Evaluation of Clustering:** Assessing Clustering Tendency, Determining the Number of Clusters, Measuring Clustering Quality

UNIT-5 **Knowledge Discovery**, innovative techniques for knowledge discovery, application of those techniques to practical tasks in areas such as fraud detection, scientific data analysis, and web mining **Outlier Detection:** Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches

Data Mining Trends and Research Frontiers: Mining Complex Data Types: Mining Sequence Data: Time-Series, Symbolic Sequences andBiological Sequences, Mining Other Kinds of Data, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Books

1. Han J & Kamber M, "Data Mining: Concepts and Techniques", Third Edition, Elsevier, 2011

Reference Books:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008

2. Kargupta, Joshi,etc., "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt Ltd, 2007

3. Dunham, Margaret H, Data Mining: Introductory and Advanced Topics, Prentice Hall.

IT4057: Image Processing

Teaching Scheme	Examination Scheme	
Lectures: 3Hrs/Week	**Class Test-I**	**:15 Marks**
Credits: 3	**Class Test-II**	**:15 Marks**
	Teachers Assessment	**:10 Marks**
	End Semester Exam	**:60 Marks**

Prerequisites: Computer Algorithm

Course Description: To learn and understand the fundamentals of digital image processing, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing

Course Objectives:

- To learn and understand Digital Image Processing fundamentals.
- To study basic image processing operations.
- To understand image analysis algorithms.

Course Outcomes

After completing the course, students will able to:

CO1	Understand the basics of formation and representation of images.
CO2	Know the effect of different image enhancement techniques.
CO3	Model the Image Restoration process in both time and frequency domains
CO4	Learn Edge detection algorithms and its importance in image processing.
CO5	To provide broader understanding of image morphology and image compression

Detailed Syllabus:

Unit 1 **Introduction to Image processing** Introduction, Resolution, Human visual system, Classification of digital images, Image types(optical and microwave), Elements of an image processing system, Image file formats(tiff, jpeg, ico, ceos, png, raster image format, Image sampling and quantization, Some Basic Relationships Between Pixels

Unit 2 **Image Enhancement** Thresholding, Segmentation, Watershed Segmentation, Edge-based 6 Segmentation, Fuzzy Segmentation Spatial domain techniques – Image Negative, Contrast stretching, gray level slicing, bit plane slicing, histogram and histogram equalization, local enhancement technique, image subtraction and image average, low–pass spatial filters, median filtering, high-pass spatial filter, Frequency domain techniques- Ideal low-pass filter, butterworth low-pass filter, High-pass filter, Homo-morphic filters.

Unit 3 **Image Restoration and Reconstruction** A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations. Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares

Filtering. Geometric Mean Filter, Image Reconstruction from Projections.

Unit 4 **Morphological Image Processing & Segmentation:** Detection of discontinuities, Point, Line and Edge Detection, Thresholding. Region-Based Segmentation Laplacian of Gaussian, Derivative of Gaussian, Canny Edge Detection. Morphological operations, Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformation, Basic morphological algorithms for boundary extraction, Region filling, extraction of connected components, thinning and thickening.

Unit 5 **Image Compression and Object Representation:** Introduction to Image Compression and its need, Coding Redundancy, Classification of Compression Techniques (Lossy and Losless - JPEG, RLE, Huffman, Shannon fano), Scalar & Vector Quantization. Introduction to Object Recognition, Object representation (Signatures, Boundary Skeleton), Simple Boundary Descriptors, Regional descriptors(Texture).

Text and Reference Books

1. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing'', Pearson Education, 3rd Edition, 2009.
2. Anil Jain, "Fundamentals Of Digital Image Processing", Anil Jain PHI, 1989.
3. B. Chanda, D Dutta Majumder, "Digital Image Processing and Analysis'', Prentice-Hall, India, 2002
4. J.G. Proakis, "Introduction to Digital Signal Processing", PHI, 2007.
5. S. Sallivahanan, "Digital Signal Processing", Tata McGraw Hill, 2001.
6. William Pratt, "Digital Image Processing", John Willey & Sons Inc, 2007.

IT4058 : Cloud Computing

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs/Week	**Class Test-I**	**:15 Marks**
Credits: 3	**Class Test-II**	**:15 Marks**
	Teachers Assessment	**:10 Marks**
	End Semester Exam	**:60 Marks**

Prerequisite: IT 3046 Operating Systems, IT 3044 Computer Networks

Course Objectives:

To learn cloud computing concepts and various cloud platforms. To design various applications in cloud computing.

Course Outcomes:

CO1	Describe computing environment and infrastructure, cloud architectures types
CO2	Characterize the distinctions between different cloud services
CO3	Explain virtualization and their role in elastic computing
CO4	Explain major security and privacy problems in the cloud and how they are addressed with the security mechanisms

Detailed Syllabus:

Unit 1	**Introduction:** Introduction of Cloud Computing, model architecture and computing environments**,** Cloud deployment models, Cloud characteristics, challenges and Risks. Service oriented architecture (SOA) and Cloud Computing Reference Architecture by IBM
Unit 2	**Cloud Services :** Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Business-Process-as-a-service (BPaaS), Identity-as-aservice (IDaaS), Communication-as-a-service (CaaS), Monitoring-as-a-service (MaaS), Storage as a service: Traditional storage versus storage cloud, Cloud Service providers: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Force.com.
Unit 3	**Virtualization:** Introduction to Virtualization, Types of Virtualization, Full and Para Virtualization, Techniques of Virtualization, Technology examples: Xen, Vmware, Web services: SOAP and REST ,Load Balancing
Unit 4	**Security in Cloud Computing** : Cloud Security Challenges, Infrastructure Security: Network, Host and Application level, Data security and Storage, Security Management in the cloud, Data Privacy, Life cycle of Data, Key Privacy concerns in cloud and Disaster Recovery.
Unit 5	**Cloud Applications** : Using Google web service exploring Google application, serving Google application portfolio :Index Search dark web, Aggregation and intermediation, productivity application and services .Case study-DropBox,Amazon, Google AppEngine

Text and Reference Books

1. Cloud computing Bible by Barrie Sosinsky, Wiley India Pvt Ltd (2011)
2. Enterprise Cloud Computing: Technology, Architecture, Applications by Gautam Shroff, Cambridge University Press.
3. Cloud Computing Implementation, Management, and Security By John W. Rittinghouse,James F. Ransome , CRC Press.
4. Mastering Cloud Computing Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi
5. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication
6. Borko Furht, "Handbook of Cloud Computing", Springer
7. Venkata Josyula,"Cloud computing – Automated virtualized data center", CISCO Press
8. Greg Schulr,"Cloud and virtual data storage networking",CRC Press
9. Mark Carlson,"Cloud data management and storage", Mc Graw hill
10. Lizhe Wang, " Cloud Computing:Methodology, System and Applications", CRC Press
11. Cloud computing: Data Intensive Computing and Scheduling by Chapman Hall/CRC
12. Christopher M. Moyer, Building Applications in the Cloud: Concepts, Patterns, and Projects
13. IBM smart storage cloud Red paper by Larry Coyne Mark Bagley Gaurav Chhaunker
14. Google Apps by Scott Granneman,Pearson
15. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
16. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
17. Stefano Ferretti et.al.,‖QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing

IT 4078: Compiler Construction

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs/Week	**Test 1**	**: 15 Marks**
Credits :04	**Test 1**	**: 15 Marks**
	Teachers Assessment	**: 10 Marks**
	End Semester Exam	**: 60 Marks**

Pre-requisite: Theory of Computation

Course Objectives:
Given the knowledge of languages and grammars with tools to process them, a graduate IT student will be able to solve problem of creating a language processing tool and understand ways of its optimization.

Course Outcomes:

CO1 Illustrate the knowledge of different translators and modern compiler

CO2 Apply the knowledge of patterns, tokens & regular expressions for solving a problems for appropriate solutions

CO3 To acquire knowledge about different parsing techniques, techniques to generate intermediate code and different optimization techniques

CO4 Understanding of compiler optimization techniques would enable students to write reasonably efficient programs

CO5 Recognize the need of understandable error reports, accurate and reliable object code, and efficient use of in-memory data structures.

Detailed Syllabus:

Unit 1 Introduction to compilers, compilers and translators, phase structure of a typical compiler, Number of passes, ideas about lexical analysis, syntax analysis, code optimization and code generation, design of lexical analyzer. Lexical Analysis -Role of lexical analyzer, recognition of tokens, Design of Lexical analyzers, tool for study of lex

Unit 2 Syntax specification of programming languages, Design of top-down parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR,LR parsers. Dealing with ambiguity of the grammar. Study of syntax directed definitions and syntax directed translation schemes as notational frame work to specify the translations. Using syntax directed translation schemes for translation of expressions, controls structures, declarations, procedure calls

Unit 3 Storage allocation and run time storage administration, Implementation of Simple Stack allocation Schemes, Storage allocation in Block Structured Languages symbol table management, Error detection and recovery, error recovery in LR parsing, error recovery in LL parsing, Automatic error recovery in YACC.

Unit 4 Introduction to Important code optimization techniques, loop optimization, control flow

analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables. DAG representation of Basic Blocks, value numbers and algebraic laws, Global data flow analysis, Dominators, Reducible flow graphs, DFS

Unit 5 Code Generation: Object programs, problems in code generation, Machine model, Simple code generator, Register allocation and assignments, Problem, Code generation from DAGs, peephole optimization

Text/ References:

1.Principles and practice of compiler writing : Aho, Sethi , Ullman , Addison Wesley
2.Compiler Design in C : Alan Holub , PHI
3.Crafting a compiler : Fischer and LeBlanc , Addison Wesley
4.Principles of Compiler Design : Aho A. V., Ullman J.D , Narosa Publishing House.

IT4080 : Soft Computing

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hrs/Week	**Class Test 1 :15 Marks**
Credits:4	**Class Test 1 :15 Marks**
	Teachers Assessment : 10 Marks
	End Semester Exam : 60 Marks

Course Description: After completing this course, students will have fundamental understanding of soft computing. Topics include types of neural networks, genetic algorithms, and Fuzzy logic. These soft computing tools will help students to carry out the research.

Course Objectives:

- Select models of ANN and Fuzzy Logic
- Apply models in practice for solving problems
- Use Neural networks, GA, Fuzzy techniques

Course Outcomes

After completing the course, students will able to:

CO1	Describe artificial neural networks and different learning algorithms to formulate computing requirements
CO2	Identify soft computing techniques and their role in professional engineering practice
CO3	Apply fuzzy logic and reasoning to handle uncertainty in engineering problems
CO4	Make use of genetic algorithms to solve optimization problems
CO5	Demonstrate Hybrid Techniques and applications of soft computing

Detailed Syllabus:

Unit 1 Introduction to soft computing, structure and working of a biological neural network, artificial neural network, terminology, models of neurons, Basic learning laws, functional units for ANN for Pattern Recognition Task

Unit 2 Basic concepts of Fuzzy Logic, linguistic variables, possibility distributions, fuzzy rules, Fuzzy sets, Operations on fuzzy sets, properties, geometric representation of fuzzy sets, possibility theory

Unit 3 Fuzzy Logic in database and Information systems, fuzzy relational data models, operations in fuzzy relational data Models, fuzzy object oriented databases, Fuzzy information retrieval and web search

Unit 4 Basics of Genetic algorithm, Design issues, Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA.

Unit 5 Hybrid Soft Computing Techniques & Applications :
Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion

approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Text Books

1. B. Yegnanarayana , "*Artificial Neural Networks*", PHI publications
2. Satish Kumar, "*Neural Networks- A classroom Approach*", TMH Publication
3. John Yen, Reza Langari, "*Fuzzy Logic*", Pearson Education
4. S. Rajasekaran, Vijaylakshmi Pari, "Neural networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications", PHI publication.

Reference Books

1. Lotfi A. Zadeh, "Soft computing and Fuzzy Logic",World Scientific Publishing Co., Inc. River Edge, NJ, USA.
2. J.S.R.Jang, C.T.Sun and E.Mizutani, .Neuro-Fuzzy and Soft Computing., PHI, 2004, Pearson Education 2004.
3. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

OEIT4001: Machine Learning	
Teaching Scheme **Lectures: 4 Hrs/Week** **Credits: 3**	**Examination Scheme** **Class Test-I : 15 Marks** **Class Test-II : 15 Marks** **Teachers Assessment : 10 Marks** **End Semester Exam : 60 Marks**

Prerequisites: IT2032 Data Structures, IT2038 Discrete mathematics and Structure

Course Description: Machine Learning is the study of how to build computer systems that learn from experience. The course covers the basic concepts and techniques of Machine Learning. It includes ML approaches as Decision Trees and Bayesian Learning ,SVM,Reinforcement learning ,clustering, dimensionality reduction, Kernel methods. These course will help students to carry out the research.

Course Objectives:

- To introduce concepts and techniques of Machine Learning.
- To become familiar with regression methods, classification methods, support vector machine.
- To become familiar with clustering methods and Dimensionality reduction Techniques.

Course Outcomes

After completing the course, students will able to:

CO1 Ability to analyze and appreciate the applications which can use Machine Learning Techniques.
CO2 Ability to understand optimization techniques.
CO3 Ability to understand the difference between supervised and unsupervised learning methods.
CO4 Apply the knowledge of SVM and Reinforcement Learning
CO5 Ability to appreciate Dimensionality reduction techniques.

Detailed Syllabus:

Unit 1 **Introduction to Machine Learning:** What is Machine Learning?, Key Terminology, Types of Machine Learning, Issues in Machine Learning, Application of Machine Learning, How to choose the right algorithm, Steps in developing a Machine Learning Application.

Unit 2 **Introduction to optimization:** The gradient method, Momentum term and adaptive step sizes, batch and on-line optimization, Ljung's convergence conditions.
Association rule learning: Algorithms- Apriori algorithm, Eclat algorithm, FP-growth algorithm, k optimal pattern discovery.

Unit 3 **Supervised Learning (Regression and Classification):**
Learning with Regression : Linear Regression, Logistic Regression.
Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naïve Bayes

Learning with trees : Using Decision Trees, Constructing Decision Trees, Classification and Regression Trees (CART).

Unit 4 **Support Vector Machines(SVM)** Maximum Margin Linear Separators, Quadratic Programming solution to finding maximum margin separators, Kernels for learning non-linear functions.**Beyond Binary Classification:** Multi-class/Structured Outputs, Ranking Reinforcement Learning

Unit 5 **Unsupervised Learning Clustering Algorithms**- Connectivity based clustering (Hierarchical clustering), Centroid based clustering, Distribution-based clustering, Density-based clustering. Evaluation of Clustering Results- Internal evaluation, External evaluation, Applications. **Dimensionality Reduction**: Dimensionality Reduction Techniques, Principal Component Analysis, Independent Component Analysis.

Kernal Methods

Text and Reference Books

1. Peter Harrington "Machine Learning In Action", DreamTech Press
2. EthemAlpaydın, "Introduction to Machine Learning", MIT Press
3. Tom M.Mitchell "Machine Learning" McGraw Hill
4. Stephen Marsland, "Machine Learning An Algorithmic Perspective" CRC Press
5. William W.Hsieh, "Machine Learning Mehods in the Environmental Sciences", Cambridge
6. Han Kamber, "Data Mining Concepts and Techniques", Morgann Kaufmann Publishers
7. Margaret.H.Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education

IT4059: Lab Data Mining

Teaching Scheme	**Examination Scheme**
Practical: 2Hrs/Week	**Term Work :25 Marks**
Credits :01	**Practical Examination & Viva Voce :25 Marks**

Prerequisites: IT 2041 Lab: Database Management System, IT3054 Lab: Advanced Database Management System

Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Evaluate models/algorithms with respect to their accuracy.
CO2	Discover and measure interesting patterns from different kinds of database
CO3	Demonstrate capacity to perform a self directed piece of practical work that requires the application of data mining techniques
CO4	Develop hypotheses based on the analysis of the results obtained and test them
CO5	Plan, design and deploy the necessary data mining technologies to support a software system

List of Experiments

Sr. No.	Details
	Group A: Study Experiments
1	Introduction about launching the Weka tool, Weal Explore
2	Introduction to the classification of Mining techniques and Attribute Relation File Format (ARFF)
	Group B: Perform using Weaka
3	To perform Preprocessing, Classification and Visualization techniques on Customer dataset.
4	To perform Preprocessing, Classification and Visualization techniques on Weather dataset
5	To perform Clustering technique on Customer dataset.
6	To perform Association technique on Customer dataset,, Agricultural data set
7	To perform all the techniques on Company dataset
	Group C : Develop using any language
8	Introduction to Data Cleansing,implement Data Cleansing applying uppercase on first name in C++/Java
9	Develop an application to extract association mining rules.
10	Develop an application for classification of data.
11	Develop an application for implementing one of the clustering technique
12	Develop an application for implementing Naïve Bayes classifier
13	Develop an application for Decision tree classifier
	Group D: Mini Project
14	Implement one application using data mining

IT4060: Lab Image Processing

Teaching Scheme	**Examination Scheme**
Practical: 2Hrs/Week	**Term Work :25 Marks**
Credits :01	**Practical Examination & Viva Voce :25 Marks**

Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Apply basics of Image Processingto find solutions to problems
CO2	Analyze the output of different filtering methods
CO3	Select edge detection methods to detect edgesof a image
CO4	Apply various morphological operationson image
CO5	Experiment with data compression using Huffman coding

List of Experiments

Sr. No.	**Details**
1.	Perform Point processing in spatial domain a. Negation of an image b. Thresholding of an image c. Contrast Stretching of an image
2.	Perform the experiments for histogram equalization
3.	Perform Zooming by interpolation and replication
4.	Implement Filtering in spatial domain a. Low Pass Filtering b. High Pass Filtering c. Median filtering
5.	Implement Filtering in frequency domain a. Low pass filter b. High pass filter
6.	Implement edge detection using derivative filter mask a. Prewitt b. Sobel c. Laplacian
7.	*Im*plement boundary extraction algorithm
8.	Implement different morphological operations
9.	Implement data compression using Huffman coding

Implementation of the programs is to be done using MATLAB platform.

IT4061: Lab- Cloud Computing

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs/Week	**Term Work : 25 Marks**
Credits:01	**Practical Examination & Viva Voce: : 25 Marks**

Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1 Create Virtual Machine images and to deploy them on a Cloud.
CO2 Characterize performance of cloud equipment.
CO3 Participate in a group atmosphere for the defining, planning, and execution of a cloud
CO4 Installation of Clould
CO5 Develop an understanding of economic issues related to cloud

List of Experiments

Sr. No.	Details
1.	Introduction to cloud computing.
2.	Implementation of SOAP Web services in C#/JAVA Applications.
3.	Implementation of RESTFul Web services in C#/JAVA Applications.
4.	Implementation of Para-Virtualization using VMWare's Workstation/ Oracle's Virtual Box and Guest O.S
5.	Implementation of Full-Virtualization using VMWare's ESXi and Guest O.S.
6.	Creating a Warehouse Application in SalesForce.com.
7.	Installation and Configuration of Single-Node Setup in Hadoop.
8.	Create any Application (Ex: Word Count) Using Hadoop Map/Reduce.
9.	To study Cloud security challenges.
10.	Case Study: PAAS (Face book, Google App Engine)
11.	Case Study : Amazon Web Services

IT 4079 Lab: Compiler Construction

Teaching Scheme
Practical: 2 Hrs/Week
Credits: 01

Examination Scheme
Term Work : 25 Marks

Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1 Design lexical rules using a LEX utility to find a solution
CO2 Implement YACC tools to create a parser to interpret data
CO3 Formulate semantic rules into a parser using appropriate techniques
CO4 Use code optimization techniques to improve speed &space requirement of the program
CO5 Identify Intermediate code generation methods

List of Experiments

Sr. No.	
	Low Level (All)
1	Program to generate lexical tokens
2	Study of LEX tool
3	Program to generate a parse tree
4	Design of a Predictive parser
5	Study of YACC
	Mid Level (Any Two)
6	Program to compute FIRST of non terminals
7	Program to compute FOLLOW of non terminals
8	Program to remove left factoring
	High Level (Any One)
9	Write a program for constructing of LL(1) parsing
10	Write a program to implement LALR parsing

IT4081 Lab: Soft Computing

Teaching Scheme
Practical: 2 Hrs/Week
Credits: 01

Examination Scheme
Term Work : 25 Marks

Course Outcomes
As an outcome of completing the Laboratory course, students will able to:

CO1	Apply basics of neural network, fuzzy logic to find solutions to problems
CO2	Construct neural network models to interpret data
CO3	Select genetic algorithms methods to optimize resources
CO4	Experiment with fuzzy sets and Hebb net to meet desired needs
CO5	Experiment with hetero-associative and auto-associative net to meet desired needs

List of Experiments

Sr. No.	Details
	Level: Easy
10.	Write a program to calculate union, intersection, complement and difference of two fuzzy sets
11.	To plot various membership functions.
12.	To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality ans service.
13.	Program for McCulloch-Pitts neurons that implement logical NOT, AND and OR gates
14.	Generate XOR function using McCulloch-Pitts neural net.
	Level: Moderate
15.	Write a program to implement Roulette wheel and ranking selection method.
16.	Write a program to maximize a function subject to the constraints
17.	Write a program to calculate addition and subtraction of fuzzy sets
	Level: Hard
18.	Hebb Net to classify two dimensional input patterns in bipolar with given targets.
19.	Perceptron net for an AND function with bipolar inputs and targets.
20.	To calculate the weights for given patterns using hetero-associative neural net.
21.	To store vector in an auto-associative net. Find weight matrix & test the net with input
22.	To store the vector ,find the weight matrix with no self connection. Test this using a discrete Hopfield net.

Implementation of the programs is to be done using MATLAB platform.

IT 4062 Project Part –I

Teaching Scheme	**Examination Scheme**
Practical: 4 Hrs/Week	**Term Work : 50 Marks**
Credits: 02	**Practical Examination & Viva Voce: : 25 Marks**

Course Description:
This course is to makes students to acquire thorough knowledge and develop skills to formulate computing requirements for the solution.

Course Objectives:
To accustom with the process of undertaking literature survey/industrial visit and identifying the problem
To practice the process of solving the problem in a team
To select and use engineering fundamentals and modern IT tools
To apply management principles and testing techniques

Course Outcomes:

CO1	Work efficiently and constructively in a project team
CO2	Review literature to identify gaps and define objectives & scope of the work.
CO3	Get experiences of using obtained knowledge, and learn how to use certain tools used in the IT-community
CO4	Synthesize and integrate information for designing modules
CO5	Design innovative idea for solving the problem

Project I should be assessed based on following points

1. Quality of problem selected
2. Clarity of Problem definition and feasibility of problem solution
3. Relevance to the specialization
4. Clarity of objective and scope
5. Breadth and depth of literature survey
6. Project I should be examined through a presentation by the student project group to a panel of examiners appointed by the DBOS

IT4064 Cryptography and Network Security

Teaching Scheme	Examination Scheme	
Lectures: 3Hrs/Week	Class Test-I	:15 Marks
Credits: 3	Class Test-II	:15 Marks
	Teachers Assessment	:10 Marks
	End Semester Exam	:60 Marks

Prerequisites: IT3044 Computer Networks

Course Description: After completing this course, students will have a broad and fundamental understanding of Cryptography and Network Security. First and second unit addresses basic issues in Network Security. It gives conventional encryption algorithms and design principles. Third unit explores Authentication codes, Digital Signatures and e-mail security field. Fourth unit focuses on IP Security and Web Security. Fifth unit looks at system level security issues.

Course Objectives:

- To provide classical and modern encryption algorithms
- To accustom with public key cryptography
- To explore the use of cryptographic algorithms and security protocols to provide security over network
- To deal with security facilities designed to protect a system

Course Outcomes

After completing the course, students will able to:

CO1	Summarize classical and modern symmetric key and public key algorithms
CO2	Demonstrate Encryption and Decryption using public key algorithm
CO3	Explain use of authentication codes and security protocols
CO4	Analyze algorithms for difficulty of attacking
CO5	Examine intruders , access control, password management, malicious software issues

Detailed Syllabus:

Unit 1 **Introduction and Symmetric Key Ciphers**

Introduction to Network security: Security attacks, Security Services and Security Mechanisms. **Symmetric Ciphers**: Symmetric Cipher Model, Classical encryption techniques like Substitution and Transposition. Block cipher Principle: The Data Encryption Standard, Linear and Differential Cryptanalysis, triple DES, Linear and Differential Cryptanalysis

Unit 2 **Number Theory and Public Key Encryption**

Introduction to Number Theory: Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm.

Public Key Cryptosystem: Encryption Principles, the RSA Algorithm, Key Management, Diffie- Hellman Key Exchange

Unit 3 **Authentication and Network Security Applications**

Authentication Requirements, Authentication Functions, Digital Signatures, Authentication Protocols, Digital Signature Standards. Kerberos, X.509 Authentication service, E- mail Security: Pretty Good Privacy, S/MIME.

Unit 4 **IP Security and Web Security**

IP Security: Overview, IP security architecture, Authentication header, Web Security: Web security requirements, Secure Socket Layer (SSL): Functionality, Transport layer security TLS, Secure electronic Transactions TES.

Unit 5 **System Security**

Intruders, Intrusion Detection, Password Management, Viruses, Virus countermeasures. Firewalls: Firewall Design Principles, Trusted Systems

Text and Reference Books

1. William Stallings, "Cryptography and Network Security" Pearson Education, Fourth Edition
2. Behrouz A. Forouzan & Debdeep Mukhopadhyay, "Cryptography and Network Security" Mc Graw Hill Publication , 2nd Edition
3. Robberta Bragg, Mark Phodes-Ousley &Keith Strassberge "The Complete Reference Book of Network Security", Tata McGraw-Hill Publication
4. Neal Krawetz, "Introduction to Network Security", Cengage Learning Pub

IT4065 : Internet of Things (IoT)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/Week	**Class Test 1 : 15 Marks**
Total Credits :3	**Class Test 2 :15 Marks**
	Teachers Assessment : 10 Marks
	End Semester Exam : 60 Marks

Pre-Requisite Courses: IT 3044 Computer Network, IT 3053 Mobile Computing

Course Objectives:

- To Understand Identify the components of IoT
- To learn the Architecture of IoT
- To Learn and understand the Protocol of IoT
- To Learn and Understand web of things and cloud of things
- To Understand security issues in IoT
- To Understand and get an idea of some of the application areas where Internet of Things can be applied

Course Outcomes:

CO1	Summarize Challenges and opportunities of IoT
CO2	Characterize building block of IoT and role of wired and wireless network
CO3	Understand protocols and IoT Analytics- Data visualization and its importance
CO4	Interpret WoT and cloud of things architectures
CO5	Summarize security issues and security services of IoT

Detailed Syllabus

Unit 1 **Introduction to Internet of Things** Introduction to IoT- Overview of IoT-What is IoT-Why IoT-Vision of IoT- Characteristics of IoT- Four Pillars of IoT- Challenges and requirements of IoT-Opportunities for IoT- Introduction M2M- M2M to IoT- An emerging industrial structure for IoT.

Unit 2 **IoT Architecture** IoT Layered Architecture- Architectural and building block of IoT-Networking and Communication – Wired & Wireless connectivity and technology – IoT and Wireless Sensor Network- NFC,RFID, ZigBee.

Unit 3 **IoT Protocol and Analytics** IoT Protocol stack- TCP/IP Protocol stack vs. IoT Protocol stack- IoT Protocol Standardization- IoTProtocol:MQTT, CoAP, AMQP, DDS, REST, XMPP- Cloud Computing in IoT- IoT with Cloud Architecture- What is IoT Analytics-Data visualization and its importance in IoT –Internet of Things and Big Data.

Unit 4 **Web of Things versus Internet of Things** – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things -The Cloud of Things Architecture

Unit 5 **IoT Security, Privacy and Trust and Applicatipon** Need of IoT Security – Issues in IoT security – Trust for IoT - Security and Privacy for IoT – Physical IoT Security-On Devices Security and Privacy - Security and Privacy in IoT Cloud. Applicatipon of IOT

Text and Reference Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands-on-Approach)",** 1stEdition, VPT, 2014.
3. Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013

IT4084 : Information Retrieval

Teaching Scheme	Examination Scheme	
Lectures: 4Hrs/Week	**Test-1**	**:15 Marks**
Credits: 4	**Test-2**	**:15 Marks**
	Teachers Assessment	**:10 Marks**
	End Semester Exam	**:60 Marks**

Prerequisites: IT2039 Database Management Systems.

Course Description: After completing this course, students will gain a good understanding of the foundation concepts of information retrieval(IR) techniques and be able to apply these concepts into practice. The subject covers the basics and important aspects associated with IR, need of retrieval, storage and searching techniques, retrieval performance evaluation and ontology, distributed and multimedia IR and web searching etc.

Course Objectives:

1. To understand information retrieval process.
2. To understand concepts of clustering and how it is related to Information retrieval.
3. To deal Storage, Organization & Access to Information Items.
4. To evaluate the performance of IR system.
5. To understand information sharing on semantic web.
6. To understand the various applications of Information Retrieval giving emphasis to multimedia and distributed IR, web Search.

Course Outcomes

After completing the course, students will able to:

CO1 Realize the concept of Information retrieval.

CO2 Deal with storage and retrieval process of text and multimedia data

CO3 Evaluate performance of any information retrieval system.

CO4 Interpret use of Search Engines and Web crawlers.

CO5 Get to knoe various applications of Information Retrieval giving emphasis to multimedia and distributed IR, web Search retrieval

Detailed Syllabus:

Unit 1 **INTRODUCTION:** Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. Automatic Text Analysis: Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing,Automatic Classification. Measures of Association, Different Matching Coefficient, Classification Methods, Cluster Hypothesis, Clustering Algorithms, Single Pass Algorithm, Single Link Algorithm

Unit 2 **STORAGE AND SEARCHING TECHNIQUES:**

Storage: Inverted file, Suffix trees & suffix arrays, Signature Files, Clustered files.

IR Models: Basic concepts, Boolean Model, Vector Model

Searching strategies: Boolean Search, Serial search, cluster based retrieval, Query languages, Types ofqueries, Patterns matching, structural queries.

Unit 3 **RETRIEVAL PERFORMANCE EVALUATION AND ONTOLOGY**

Performance evaluation: Precision and recall, alternative measures.

Ontology: Ontology based information sharing, Ontology languages for semantic web, Ontologycreation.

Unit 4 **DISTRIBUTED AND MULTIMEDIA IR**

Distributed IR: Introduction, Collection Partitioning, Source Selection, Query Processing, web issues.

Multimedia IR: Introduction, Data Modeling, Query languages, Generic multimedia indexingapproach, One dimensional time series, two dimensional color images, Automatic feature extraction.

Unit 5 **WEB SEARCHING:**

Challenges, Characterizing the Web, Search Engines, Browsing, Mata-searchers,Web crawlers, Meta-crawler, Web data mining, Finding needle in the Haystack, Searching using Hyperlinks, Page ranking algorithms.

Text Books:

1. Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6.
2. C.J. Rijsbergen, "Information Retrieval", (www.dcs.gla.ac.uk).
3.Heiner Stuckenschmidt, Frank van Harmelen, "Information Sharing on th Semantic Web", Springer International Edition, ISBN 3-540-20594-2.

Reference Books:

1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze"Introduction to Information Retrieval", Cambridge University Press, ISBN 978-0-521-86571-5
2. Mark leven, "Introduction to search engines and web navigation", John Wiley and sons Inc., ISBN 9780-170-52684-2.
3. V. S. Subrahamanian, Satish K. Tripathi "Multimedia information System", KulwerAcademic Publisher.
4. ChabaneDjeraba,"Multimedia mining A highway to intelligent multimedia documents",Kulwer Academic Publisher, ISBN 1-4020-7247-3.
5. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition,2011
6. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2010.

Web Resources:

http://www.cs.utexas.edu/users/mooney/ir-course
http://www.informationretrieval.org

IT 4085 : Geographical Information System

Teaching Scheme	**Examination Scheme**	
Lectures: 4 Hrs/Week	**Class Test 1**	**: 15 Marks**
Credits: 4	**Class Test 2**	**: 15 Marks**
	Teachers Assessment	**: 10 Marks**
	End Semester Exam	**: 60 Marks**

Prerequisites:

Course Description: This is to provide in-depth information about Geographical information system a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. It is to cover all dimensions of Geographical Information System concepts like spatial referencing, data analysis, data visualization in maps etc.

Course Objectives:

To recognize organization of GIS
To make students aware of GIS capabilities and tools and methods.
To give the knowledge of real world applications in GIS

Course Outcomes

After completing the course, students will able to:

CO1	To Understand fundamentals of GIS
CO2	To be able to apply knowledge of data management in GIS
CO3	Solving the problems on spatial referencing and positioning
CO4	To Understand applications of GIS models
CO5	To study visualization concepts in GIS

Detailed Syllabus:

Unit 1	A gentle introduction of GIS: The Nature of GIS, The real world and representation of it. Geographic Information and Spatial Data type: Models and representation of real world, geographic phenomena, Computer representation of geographic information, organising and managing spatial data, The temporal dimension.
Unit 2	Data management and processing systems: Hardware and Software trends, GIS, Stages of spatial data handling, Database management system, GIS and Spatial database.
Unit 3	Spatial referencing and positioning: Spatial referencing, Satellite based positioning. Data entry preparation: Spatial data input, data quality, data preparation, point data transformation.
Unit 4	Spatial data analysis: classification of analytical GIS capabilities, retrieval, classification and measurement, overlay functions, Neighbourhood functions, network analysis, GIS and application models, error propagation in spatial data processing
Unit 5	Data visualization: GIS and maps, the visualization process, visualization strategies, the cartographic toolbox, how to map, Map cosmetics, map dimension

Text and Reference Books

1. "Principles of GIS systems" by Otto Huisman and Rolf A. De
2. "GIS, Environmental Modeling and Engineering", Second Edition By Allan Brimicombe
3. "Remote sensing, models and methods for image processing "Third Edition by Robert A. Schowengerdt

Website Links

1. The Open GIS Consortium "Learning Resources Page"
2. ColorBrewer, a useful online guide to using color in maps and graphics

OEIT4002 : Big Data Analytics

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs/Week	Test 1	: 15 Marks
Total Credits: 3	Test 2	: 15 Marks
	Teachers Assessment	: 10 Marks
	End Semester Exam	: 60 Marks

Course Description:

Data Analytics is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions.

Course Objectives:

1. To provide concept of Big data analytics
2. To explore Analytics Platform
3. To understand Descriptive and Inferential Statistics

Course Outcomes

After completing the course, students will able to:

CO1 Illustrate big data and components
CO2 Identify Advanced Analytics Platform and discuss implementation of Big Data Analytics
CO3 Describe HIVE and PIG
CO4 Descriptive Statistics and Inferential Statistics
CO5 Demonstrate deep learning and make proper decision to select Big DA solution

Detailed Syllabus

Unit 1 **Introduction to Big data:**
Introduction, Challenge, Drivers for Big data, Big data analytics Applications
Architecture Components: Massively Parallel Processing (MPP) Platforms**,** Unstructured Data Analytics and Reporting-Search and Count-Context-Sensitive and Domain-Specific Searches-Categories and Ontology-Qualitative Comparisons-Focus on Specific Time Slice or Using Other Dimensions, Big Data and Single View of Customer/Product, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines

Unit 2 **Advanced Analytics Platform: Real**-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines-Entity Resolution-Model Management-Command Center-Analytics Engine, Discovery Using Data at Rest, Integration Strategies Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data Governance-Integrating Big Data with MDM, Journey, Milestones, and Maturity Levels- Analytics Business Maturity Model Components to build big data analytics solution**-**Architecture, Hardware, Functionality, Process Decision criteria for selecting A big data analytics solution

Unit 3 **Introduction to NoSQL**, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Comparing SQL and NoSQL, Introduction of apache, cassandra and its needs, Characteristics of cassandra

Big data with Hive and Pig: Overview of hive and its architecture, Hive data types and File format, Hive query language (HQL), Introduction to Pig, pig latin overview, Data types in Pig and Running Pig

Unit 4 **Descriptive Statistics and Inferential Statistics**

Descriptive Statistics, Probability Distributions,**Inferential Statistics-** Inferential Statistics through hypothesis tests, Permutation & Randomization Test, Regression, ANOVA(Analysis of Variance)

Unit 5 **Neural Networks:** introduction to neural network, Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Deep learning: Introduction, Need for deep learning, Overview of Deep Learning Applications, Stochastic Gradient Descent, Backpropagation, Introduction to Convnet (architectures – AlexNet, VGG, Inception, ResNet – loss surface

Text and Reference Books

1. Arvind Sathi, "Big data Analytics", First edition
2. Hastie, Trevor, et al., The elements of statistical learning, Vol. 2. No. 1. New York: springer, 2009.
3. Montgomery, Douglas C., and George C. Runger, Applied statistics and probability for engineers. John Wiley & Sons, 2010

Web source

1. Deep Learning Tutorial,Release 0.1, LISA lab, University of Montreal
2. Maryam M Najafabadi, et.al., "Deep learning applications and challenges in big data analytics", Journal of Big Data, a Springer Open Journal, (2015) 2:1 DOI 10.1186/s40537-014-0007-7
3. http://deeplearning.net/tutorial/

IT4066 Lab: Cryptography and Network Security

Teaching Scheme
Practical: 2Hrs/Week
Credits:01

Examination Scheme
Term Work : 50 Marks
Practical Examination & Viva Voce: : 25 Marks

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1 Explore the use of Euclid's algorithm
CO2 Identify and formulate computing solution for symmetric key algorithms
CO3 Practice RSA and DH algorithm
CO4 Analyze the results of frequency of letters program
CO5 Summarize different modern tools used for system security

List of Experiments

Sr. No.	Details
1	Write a program for implementation of Euclid's Algorithm.
2	Demonstrate Caesar Cipher with the help of a program A. Sender's Side(Encryption) B. Receiver's Side(Decryption)
3	Formulate computing solution for Transposition Cipher A. Sender's Side(Encryption) B. Receiver's Side(Decryption)
4	Implement Key generation , Encryption and Decryption using RSA Algorithm
5	Write a program for implementation of DH Algorithm also find the solution for man – in- the middle attack
6	Write a program checking frequency of letters in a three different types of files and analyze the result
7	Write a program for implementation of Radix -64
8	Study of system security modern tools –CASE Study : Group Activity

IT4067 Lab: Internet of Things (IoT)

Teaching Scheme	**Examination Scheme**
Practical: 2Hrs/Week	**Term Work : 50 Marks**
Credits :01	**Practical / Viva Voce :25 Marks**

Pre-Requisite Courses:

CO1 Explore Arduino and different types of Arduino
CO2 Implementation and use of different type of sensor
CO3 Implementation and use of different protocols using Arduino
CO4 Configure Raspberry Pi

List of Experiment

1. Study and Install IDE of Arduino and different types of Arduino.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.
4. Study different type of sensor and implement ultra-sonic sensor.
5. Study the Temperature sensor and Write Program foe monitor temperature using Arduino.
6. Study different shield of Arduino and implement Wifi shield using Arduino.
7. Study and Implement RFID, NFC using Arduino.
8. Study and implement MQTT protocol using Arduino.
9. Study and Configure Raspberry Pi.
10. WAP for LED blink using Raspberry Pi.
11. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.12.
12. WAP for Web controlled LED using REST protocol and Arduino

IT 4086 Lab: Information Retrieval

Teaching Scheme	Examination Scheme
Practical : 2 Hrs/Week	**Term Work : 25 Marks**
Credits : 01	**Viva Voce : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Explore Conflation Algorithm & Document Representative.
CO2	Practice Clustering using single pass algorithm.
CO3	Analyze Indexing, Inverted Files and searching with the help of inverted file
CO4	Summarize working of Web Crawler.
CO5	Explore recent papers on IR, Digital Libraries and Multimedia IR.

List of Experiments:

Sr. No.	Details
	Level :Basic (all)
1	To implement Conflation Algorithm using File Handling.
2	To implement single pass algorithm for clustering .
3	To implement a program Retrieval of documents using inverted files.
4	To implement a simple Web Crawler in Java.
	Level :Complex (any three)
5	To implement a program for feature extraction in 2D colour images (any features like color, texture etc.)
6	To study recent papers on IR / search engine / Digital Libraries/ content management system for document .
7	Assignments based on Multimedia.
8	Assignments based on Digital Libraries.

IT4087- Lab Geographical Information System

Teaching Scheme	**Examination Scheme**
Practical: 02Hrs/Week	**Term Work : 25 Marks**
Credits:01	**Practical & Viva Voce : 25 Marks**

Course Outcomes Expected: On successful completion of this course, students will be able to:

CO1 Demonstrate the concepts of ArcGIS
CO2 Collect the knowledge of working principles of different ARC.
CO3 To create various graphics and shapes in user defined area
CO4 To perform analysis and Extraction on dataset

Suggestive List of experiments:

1 To study Organization of ArcMap

2 To Convert Dynamic Labels to Annotation

3 To Perform Analysis in the Map Display

4 Query to find precise information and ascertain patterns in the data such as the location of customers or low-income residents.

5 To study Repeating Shapes Tool for ArcGIS and generate an array of repeating shapes over a user-specified area.

6 To study Tools for Graphics and Shapes for ArcGIS

7 To study DEM Surface Tools for ArcGIS

8 To generate a variety of surface characteristics of a landscape, using both projected and unprojected digital elevation model (DEM) rasters

9 To study and install Raster Extractor tool for ArcGIS

10 To extract raster datasets from a raster catalog, with options to combine and clip those rasters to the current display extent.

11 To quickly select all raster catalog datasets that intersect the selected features from any feature class.

IT 4068 Project II

Teaching Scheme	**Examination Scheme**
Practical: 12 Hrs/Week	**Term Work : 50 Marks**
Credits:06	**Practical Examination & Viva Voce: : 100 Marks**

Course Description:
After completing this course, students will be able to develop solution for a practical problem with innovative ideas and thus enable them to have a practical exposure.

Course Objectives:
To accustom with the process of undertaking literature survey/industrial visit and identifying the problem
To practice the process of solving the problem in a team
To select and use engineering fundamentals and modern IT tools
To apply management principles and testing techniques

CO1	Develop team spirit among students in order to make them learn how to work with colleagues
CO2	Planning and follow-up of a complex project task, and taking care of run time and compile time errors that might occur
CO3	Integrate smaller modules into a larger one
CO4	Express ideas coherently & communicate effectively in both verbal and written form
CO5	Develop solution for the selected problem within stipulated time and test if it meets the requirements and prepare a report in proper format