

PACEINSTITUTE OF TECHNOLOGY & SCIENCES, ONGOLE-523272 (AUTONOMOUS)
AR-18 REGULATIONS B.Tech COURSE STRUCTURE
B.Tech Artificial Intelligence and Data Science

| I YEAR I SEMESTER | | | | | | | | |
|--------------------------|-------------|--|-----------|----------|----------|----------------|-----------------|-----------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | | Induction Program | 3 weeks | | | 0 | - | - |
| 2 | P18HST01 | English-I | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18BST01 | Mathematics-I | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18BST05 | Applied Chemistry | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | P18EST01 | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18EST03 | C-Programming For Problem Solving | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | P18BSL03 | Applied Chemistry Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18ESL01 | Basic Electrical & Electronics Engineering Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18ESL03 | C-Programming For Problem Solving Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total Periods | | | 15 | 0 | 9 | 19.5 | 320 | 480 |

| I YEAR II SEMESTER | | | | | | | | |
|---------------------------|-------------|---|-----------|----------|-----------|----------------|-----------------|-----------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | P18HST02 | English-II | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18BST02 | Mathematics-II | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18BST03 | Applied Physics | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18EST02 | Engineering Graphics | 1 | 0 | 3 | 2.5 | 40 | 60 |
| 5 | P18EST05 | Python Programming | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18MCT02 | Environmental Sciences | 3 | 0 | 0 | 0 | 100 | -- |
| 7 | P18ESL04 | Python Programming Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18BSL01 | Applied Physics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18ESL02 | Engineering Workshop | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | P18HSL01 | English Language Communication Skills Lab | 0 | 0 | 3 | 2 | 40 | 60 |
| Total Periods | | | 16 | 0 | 15 | 21 | 460 | 540 |

| II YEAR I SEMESTER | | | | | | | | |
|----------------------|----------|-----------------------------|-----------|----------|----------|-------------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | P18CST01 | JAVA Programming | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18CST02 | Data Structures | 3 | 1 | 0 | 4 | 40 | 60 |
| 3 | P18CST04 | Computer Organization | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18ADT01 | Statistics for Data Science | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | P18CST07 | Software Engineering | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18CSL01 | JAVA Programming Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | P18CSL02 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18ECL13 | Digital Electronics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18MCT04 | Soft Skills-I | 3 | 0 | 0 | 0 | 100 | - |
| Total Periods | | | 18 | 1 | 9 | 20.5 | 420 | 480 |

| II YEAR II SEMESTER | | | | | | | | |
|----------------------|----------|--|-----------|----------|----------|-----------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | P18CST03 | Mathematical Foundations of Computer Science | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18CST09 | Operating Systems | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18AMP01 | Foundations of Artificial Intelligence | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18CST06 | Database Management Systems | 3 | 1 | 0 | 4 | 40 | 60 |
| 5 | P18AMP02 | R Programming | 2 | 0 | 2 | 3 | 40 | 60 |
| 6 | P18ECO02 | <i>Open Elective – I</i> | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | P18AML02 | OS Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18CSL05 | Database Management Systems Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | | Internship | 0 | 0 | 0 | 2 | 100 | - |
| 10 | P18MCT03 | Indian Constitution | 3 | 0 | 0 | 0 | 100 | - |
| Total Periods | | | 20 | 1 | 6 | 23 | 520 | 480 |
| | | | | | | | | |

| III YEAR I SEMESTER(AI&DS) | | | | | | | | |
|----------------------------|------|----------------------------------|-----------|----------|-----------|-----------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | | Computer Networks | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | | Design & Analysis of Algorithms | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | | Machine Learning | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | | Data Warehousing & Data Mining | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | | Professional Elective – I | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | | <i>Open Elective-II</i> | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | | Design thinking | 0 | 0 | 4 | 2 | 40 | 60 |
| 8 | | Computer Networks Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | | Machine Learning Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total Periods | | | 17 | 0 | 10 | 22 | 360 | 540 |

| <i>Professional Elective – I</i> | | |
|----------------------------------|-------------|-------------------------------------|
| S.No | Course Code | COURSE |
| i) | | Distributed Systems |
| ii) | | Software Testing |
| iii) | | Automata Theory and Compiler Design |
| iv) | | Advanced python programming |

| <i>Open Elective – II</i> | | |
|---------------------------|-------------|------------------------------------|
| S.No | Course Code | COURSE |
| i) | | Full Stack Application Development |
| ii) | | Professional Ethics |
| iii) | | Robotics |
| iv) | | Wireless sensor Networks |

| III YEAR II SEMESTER | | | | | | | | |
|----------------------|------|---------------------------------|-----------|----------|-----------|-----------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | | Data Science | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | | Web Technologies | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | | Deep Learning | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | | Data Visualization | 2 | 0 | 2 | 3 | 40 | 60 |
| 5 | | Professional Elective-II | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | | <i>Open Elective –III</i> | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | | Data Science Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | | Web Technologies Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | | Mini Project | 0 | 0 | 6 | 2 | 40 | 60 |
| Total Periods | | | 16 | 1 | 14 | 22 | 360 | 540 |

| <i>Professional Elective – II</i> | | |
|-----------------------------------|-------------|---------------------------------|
| S.No | Course Code | COURSE |
| i) | | IOT |
| ii) | | Big data Analytics |
| iii) | | Middle Ware Technologies |
| iv) | | Cryptography & Network Security |

| <i>Open Elective – Iii</i> | | |
|----------------------------|-------------|-----------------------------|
| S.No | Course Code | COURSE |
| i) | | Management Science |
| ii) | | Ad hoc Networks |
| iii) | | Natural Language Processing |
| iv) | | Operations Research |

| IV YEAR I SEMESTER | | | | | | | | |
|----------------------|------|----------------------------------|-----------|----------|-----------|-----------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | | Reinforcement Learning | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | | Medical Image Analysis | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | | Professional Elective-III | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | | Professional Elective-IV | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | | <i>Open Elective-IV</i> | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | | OOAD with UML | 0 | 1 | 2 | 2 | 40 | 60 |
| 7 | | Mini Project | 0 | 0 | 6 | 3 | 40 | 60 |
| 8 | | Employability Skills | 0 | 0 | 2 | 1 | 100 | |
| Total Periods | | | 14 | 1 | 10 | 20 | 380 | 420 |

| <i>Professional Elective – III</i> | | |
|------------------------------------|-------------|--------------------------|
| S.No | Course Code | COURSE |
| i) | | Test Mining |
| ii) | | Social Media Analytics |
| iii) | | Business Intelligence |
| iv) | | Block Chain Technologies |

| <i>Professional Elective – IV</i> | | |
|-----------------------------------|-------------|------------------------------------|
| S.No | Course Code | COURSE |
| i) | | Multimedia Application Development |
| ii) | | Applied AI (Prolog) |
| iii) | | Malware analysis in data science |
| iv) | | Cloud Computing |

| IV YEAR II SEMESTER | | | | | | | | |
|----------------------|------|--------------------------|----------|----------|-----------|-----------|------------|------------|
| S.No | CODE | COURSE | L | T | P | Credits | Internal | External |
| 1 | | Professional Elective-V | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | | Professional Elective-VI | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | | Ethics & Human Values | 2 | 0 | 0 | 2 | 40 | 60 |
| 4 | | Project | 0 | 0 | 12 | 6 | 80 | 120 |
| Total Periods | | | 8 | 0 | 12 | 14 | 200 | 300 |

| <i>Professional Elective – V</i> | | |
|----------------------------------|-------------|-------------------------------|
| S.No | Course Code | COURSE |
| i) | | Soft Computing |
| ii) | | Information Retrieval Systems |
| iii) | | Human Computer Interaction |
| iv) | | Federated Machine Learning |

| <i>Professional Elective – VI</i> | | |
|-----------------------------------|-------------|--------------------------------|
| S.No | Course Code | COURSE |
| i) | | Game Programming |
| ii) | | Software Testing Methodologies |
| iii) | | Cyber Security |
| iv) | | Augmented Reality/VR |

| Course Code | Course Name | Course Structure | | | |
|-------------|--------------|------------------|---|---|---|
| P18ITT05 | DATA SCIENCE | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

Course Objectives:

1. To understand the mathematical foundations required for data science.
2. To describe a flow process for data science problems.
3. To introduce basic data science algorithms and data visualization.
4. To learn machine tools and techniques.
5. To learn the ideas and tools for data visualization.

Course Outcomes:

1. Explain the basic terms of Linear Algebra and Statistical Inference.
2. Describe the Data Science process and how its components interact.
3. Apply EDA and the Data Science process in a case study.
4. Classify Data Science problems.
5. Analyze and correlate the results to the solutions.
6. Simulate Data Visualization in exciting projects.

UNIT –I

(9 Lectures)

Linear Algebra: Algebraic view – vectors 2D, 3D and nD, matrices, product of matrix & vector, rank, null space, solution of over determined set of equations and pseudo-inverse. Geometric view - vectors, distance, projections, eigenvalue decomposition, Equations of line, plane, hyperplane, circle, sphere, Hypersphere.

UNIT –II

(9 Lectures)

Probability And Statistics: Introduction to probability and statistics, Population and sample, Normal and Gaussian distributions, Probability Density Function, Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.

UNIT-III

(9 Lectures)

Exploratory Data Analysis And The Data Science Process: Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Data Visualization - Basic principles, ideas and tools for data visualization, Examples of exciting projects- Data Visualization using Tableau.

UNIT- IV

(9 Lectures)

Machine Learning Tools, Techniques And Applications: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Dimensionality Reduction, Principal Component Analysis, Classification and Regression models, Tree and Bayesian network models, Neural Networks, Testing, Evaluation and Validation of Models.

UNIT -V**(9 Lectures)**

Introduction To Python: Data structures-Functions-Numpy-Matplotlib-Pandas-problems based on computational complexity-Simple case studies based on python (Binary search, common elements in list), Hash tables, Dictionary.

TEXT / REFERENCE BOOKS

1. Cathy O’Neil and Rachel Shut. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
2. Introduction to Linear Algebra - By Gilbert Strang, Wellesley-Cambridge Press, 5th Edition.2016.
3. Applied Statistics and Probability for Engineers – By Douglas Montgomery.2016.
4. Jure Leskovek, Amend Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
6. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd Edition. ISBN 0123814790

| Course Code | Course Name | Course Structure | | | |
|-------------|------------------|------------------|---|---|---|
| | | L | T | P | C |
| P18CST12 | WEB TECHNOLOGIES | 3 | 0 | 0 | 3 |

Internal Marks: 40

External Marks: 60

WEB TECHNOLOGIES

Course Prerequisites: Object Oriented Programming

Course Objectives:

This course enables the students to identify the fundamental concepts for developing web application using PHP language for server side scripting, analyze how data can be transported using XML, develop a web applications with server side programming using java servlets & JSP Servlets and client side scripting with java script.

Course Outcomes:

1. Summarize the basic tags and properties in HTML, XHTML and CSS.
2. Create web pages using .client side scripting, validating of forms and XML.
3. Identify the role of server side scripting using PHP programming
4. Design dynamic web application using server side programming with java servlets.
5. Contrast on how to connect and retrieve data through web page from database using JDBC.

UNIT- I:

(9 Lectures)

HTML Common tags- List, Tables, images, forms, Frames, Links and Navigation,

CSS: Introduction, CSS Properties, Controlling Fonts, Text Formatting, Pseudo classes, Selectors.

UNIT- II:

(9 Lectures)

Client side Scripting: Introduction to Javascript: Javascript language – declaring variables, scope of variables, functions, event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model.

UNIT- III:

(9 Lectures)

Introduction to PHP: Creating PHP script, Running PHP script, Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

UNIT- IV:**(9 Lectures)**

Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions.

UNIT- V:**(9 Lectures)**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, JSP application design with MVC, Declaring variables and methods, sharing data between JSP pages, Requests and users passing control and data between pages, Sharing sessions and application data.

JDBC connectivity in JSP: Data base programming using JDBC, Studying javax.sql.* package, Accessing a database from a JSP page, Application specific database actions.

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

References:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
2. Java Server Pages –Hans Bergsten, SPD O'Reilly
3. Java Script, D. Flanagan, O'Reilly, SPD.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming World Wide Web, R. W. Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.

Web References:

1. <https://www.w3schools.com/html/>
2. <https://www.javatpoint.com/servlet-tutorial>
3. <http://nptel.ac.in/courses/106105084/>

| Course Code | Course Name | Course Structure | | | |
|-------------|---------------|------------------|---|---|---|
| P18ITT05 | DEEP LEARNING | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks: 40

External Marks: 60

DEEP LEARNING

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyze the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT- I

(9 Lectures)

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT- II

(9 Lectures)

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT- III**(9 Lectures)**

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier.

UNIT- IV**(9 Lectures)**

Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT -V**(9 Lectures)**

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

Textbooks

Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

References:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

| Course Code | Course Name | Course Structure | | | |
|-------------|--------------------|------------------|---|---|---|
| P18ITT05 | DATA VISUALIZATION | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks: 40

External Marks: 60

DATA VISUALIZATION

Course Objectives:

- To demonstrate expert knowledge of data analysis, statistics, tools, techniques and technologies of data analytics and Visualization.
- To enable learners to develop knowledge and skills in current and emerging areas of data analytics and Visualization.
- To formulate and implement a novel research idea and conduct research in the field of data analytics and Visualization.
- To critically assess and evaluate business and technical strategies for data analytics.
- To develop project-management, critical-thinking, problem-solving and decision making skills.

Course Outcomes: After completing the course, student will be able to:

- Present data with visual representations for your target audience, task, and data;
- Identify appropriate data visualization techniques given particular requirements imposed by the data;
- Display types, Geospatial displays, Interactivity
- Data Definitions and Analysis Techniques
- Implement the analytic algorithms and Basic analysis techniques

UNIT -I: INTRODUCTION AND TABLEAU PRIMER: (4Lectures)

Introduction to data visualization Data for data graphics Tableau introduction

UNIT-II: DESIGN PRINCIPLES (4 Lectures)

Design principles Categorical, time series, and statistical data graphics

UNIT-III: (8 Lectures)

Display types, Geospatial displays, Interactivity Storytelling Multivariate displays, Geospatial displays, Dashboards, interactive and animated displays

UNIT-IV: (9 Lectures)

Data Definitions and Analysis Techniques: Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning.

Descriptive Statistics: Measures of central tendency, Measures of location of dispersions

UNIT-V: (9 Lectures)

Basic analysis techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test.

Text Books:

1. Sosulski, K. (2018). Data Visualization Made Simple: Insights into Becoming Visual. New York: Routledge.
2. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond
3. H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
4. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014

References:

1. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013
2. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer
3. Mining Massive Data Sets, A. Rajaraman and J. Ullman, Cambridge University Press, 2012
4. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
5. Optional readings:
6. Few, S. (2012). Show me the numbers: Designing tables and graphs to enlighten. Burlingame, CA: Analytics Press.
7. Few, S. (2006). Information dashboard design: The effective visual communication of data. Sebastopol: O'Reilly.
8. Ware, C & Kaufman, M. (2008). Visual thinking for design. Burlington: Morgan Kaufmann Publishers.
9. Wong, D. (2011). The Wall Street Journal guide to information graphics: The do and don'ts of presenting data, facts and figures. New York: W.W. Norton & Company.
10. Yau, N. (2011). Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics. Indianapolis: O'Reilly.
11. Yau, N. (2013). Data Points: Visualization that means something. Indianapolis: O'Reilly.

| Course Code | Course Name | Course Structure | | | |
|-------------|-------------------------|------------------|---|---|---|
| P18ITT05 | MIDDLEWARE TECHNOLOGIES | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks: 40

External Marks: 60

MIDDLEWARE TECHNOLOGIES

UNIT-I (9 Lectures)

Introduction to client server computing: Evolution of corporate computing models from centralized to distribute computing, client server models. Benefits of client server computing, pitfalls of client server programming.

UNIT-II (9 Lectures)

CORBA with Java: Review of Java concept like RMI, RMI API, and JDBC. Client/Server CORBA-style, the object web: CORBA with Java.

UNIT III (9 Lectures)

Introducing C# and the .NET Platform; Understanding .NET Assemblies; Object –Oriented Programming with C#; Callback Interfaces, Delegates, and Events.

UNIT IV (9 Lectures)

Building c# applications: Type Reflection, Late Binding, and Attribute-Based Programming; Object Serialization and the .NET Remoting Layer; Data Access with ADO.NET; XML Web Services.

UNIT-V (9 Lectures)

Core CORBA / Java: Two types of Client/ Server invocations-static, dynamic. The static CORBA, first CORBA program, ORB lets with Applets, Dynamic CORBA-The portable count, the dynamic count multicount.

UNIT-VI (9 Lectures)

Existential CORBA: CORBA initialization protocol, CORBA activation services, CORBAIDL mapping CORBA java- to- IDL mapping, the introspective CORBA/Java object.

UNIT-VII (4 Lectures)

Java Bean Component Model: Events, properties, persistency, Introspection of beans, CORBA Beans.

UNIT-VIII (9 Lectures)

EJBs and CORBA: Object transaction monitors CORBA OTM's, EJB and CORBA OTM's, EJB container frame work, Session and Entity Beans, The EJB client/server development Process The EJB container protocol, support for transaction EJB packaging EJB design Guidelines.

TEXT BOOKS:

1. Client/Server programming with Java and CORBA Robert Orfali and Dan Harkey, John Wiley & Sons, SPD 2nd Edition
2. Java programming with CORBA 3rd Edition, G.Brose, A Vogel and K.Duddy, Wiley-dreamtech, India John Wiley and sons

REFERENCES:

1. Distributed Computing, Principles and applications, M.L.Liu, Pearson Education
2. Client/Server Survival Guide 3rd edition Robert or fali Dan Harkey & Jeri Edwards, John Wiley & Sons
3. Client/Server Computing D T Dewier, TMH.
4. IBM Webspere Starter Kit Ron Ben Natan Ori Sassoon, TMh, New Delhi
5. Programming C#, Jesse Liberty, SPD-O'Reilly.
6. C# Preciesely Peter Sestoft and Henrik I. Hansen, Prentice Hall of India
7. Introduction to C# using .NET Pearson Education
8. C# How to program, Pearson Education
9. C# and the .NET Platform Andrew Troelsen, Après Wiley-dreamtech, India Pvt Ltd

| Course Code | Course Name | Course Structure | | | |
|-------------|---------------------------------|------------------|---|---|---|
| P18MBO04 | CRYPTOGRAPHY & NETWORK SECURITY | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

CRYPTOGRAPHY & NETWORK SECURITY

Course Prerequisites: Computer Networks

Course Objectives:

1. The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment.
2. During this course the students will gain knowledge in various kinds of software security problems, and techniques that could be used to protect the software from security threats.

Course Outcomes:

1. Evaluate the use of encryption algorithm for achieving data confidentiality.
2. Apply secure hash functions for attaining data integrity.
3. Analyses the security mechanisms for achieving authentication.
4. Analyses the protocols for achieving availability, access control to resources and protocols for non-repudiation
5. Explore the threats and remedial measures for system security.

UNIT –I : **(10 Lectures)**

Introduction: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A Model for Internetwork security.
Symmetric Key Cryptography: Symmetric Encryption Principles, Symmetric Encryption Algorithms (DES, Triple DES and AES), Cipher Block Modes of Operations.

UNIT- II: **(8 Lectures)**

Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.

UNIT- III: **(9 Lectures)**

Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.
IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT- IV:**(9 Lectures)**

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT- V:**(9 Lectures)**

Intruders and Malicious Software: Intruders, Intrusion Detection, Viruses and Related Threats, Trusted System.

Firewalls: Firewalls-Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration.

Text Books:

1. Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, Pearson Education, 2011.
2. Network Security Essentials (Applications and Standards), William Stallings, Pearson Education.
3. Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J. David Irwin, CRC Press, 2013.

References:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press).
2. Principles of Information Security, with man, Thomson.
3. Introduction to Cryptography, Buchman, Springer.

Web References:

1. https://onlinecourses.nptel.ac.in/noc18_cs07/preview
2. <https://www.coursera.org/learn/cryptography>
3. <https://www.coursera.org/specializations/computer-network-security>
4. <https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7>

| Course Code | Course Name | Course Structure | | | |
|-------------|--------------|------------------|---|---|---|
| P18MBO04 | DATA SCIENCE | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

MANAGEMENT SCIENCE

Course Objectives:

- To understand the application of management science in decision making process & its importance, evaluation of management thought, how organization structure is designed and its principle and types.
- To understand the types of management about work study, how quality is controlled, control charts and inventory control and their types.
- To learn the main functional areas of organization i.e., Financial Management, Production Management, Marketing Management, Human resource Management, Product life cycles and Channels of Distribution.
- The learning objective of this unit is to understand the Development of Network and Identifying Critical Path.
- The learning objective of this unit is to understand the concept of strategic management, and the basic concepts of MIS, MRP, JIT, TQM, Six sigma, CMM, Supply chain management, ERP, Business Process Outsourcing, bench marking and business process re-engineering.

Course Outcomes:

- Able to apply the concepts & principles of management in real life. The student will be able to design & develop organization structure for an enterprise.
- The student can identify and apply Marketing, HRM, and Production Strategies and implement them effectively.
- Able to develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.
- Able to develop Mission, Objectives, Goals & strategies for an enterprise in dynamic environment and apply modern management techniques MIS, ERP, TQM, SCM, BPR, and Bench Marking wherever possible

UNIT-I:

(9 Lectures)

Introduction to management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness (GLOBE) structure.

UNIT – II**(9 Lectures)**

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT – III**(9 Lectures)**

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans (Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationalising change through performance management.

UNIT-IV**(6 Lectures)**

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT –V**(9 Lectures)**

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process –SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies.

Contemporary Management Practices: basic concepts of MIS, Total Quality Management (TQM), Six Sigma, Supply chain management, Enterprise Resource Planning(ERP), Business process Re- engineering and Bench Marketing,

Text Books:

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, 'Management Science' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, 'Management Science' TMH 2011.

References:

1. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
2. Biswajit Patnaik: Human Resource Management, PHI, 2011
3. Hit and Vijaya Kumar: Strategic Management, Cengage learning
4. Seth & Rastogi: Global Management Systems, Cengage learning, Delhi, 2011

Web References:

1. https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Management%20Science.pdf
2. <https://books.askvenkat.org/management-science-textbook-aryasri-pdf/>

| Course Code | Course Name | Course Structure | | | |
|-------------|------------------------|------------------|---|---|---|
| P18MBO04 | DHOC & SENSOR NETWORKS | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

DHOC & SENSOR NETWORKS

(PROFESSIONAL ELECTIVE – VI)

Course Code: IT862PE Prerequisites

1. A course on “Computer Networks”
2. A course on “Mobile Computing”

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc
- and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT – I

(9 Lectures)

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms,

Topology-based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP;

Position-based routing algorithms-Location Services-DREAM, Quorum-based;

Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT – II

(9 Lectures)

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding,

Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA,

Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based:

ODMRP, CAMP; Hybrid: AM Route, MCEDAR.

UNIT – III

(9 Lectures)

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-Geo TORA, MGR.

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over AdHoc

UNIT – IV**(9 Lectures)**

Basics of Wireless, Sensors and Lower Layer Issues

R16 B.TECH IT

Applications, Classification of sensor networks, Architecture of sensor network, Physical Layer, MAC layer, Link layer, Routing Layer.

UNIT – V**(9 Lectures)**

Upper Layer Issues of WSN

Transport layer, High-level application layer support, Adapting to the inherent dynamic

Nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

| Course Code | Course Name | Course Structure | | | |
|-------------|-----------------------------|------------------|---|---|---|
| | | L | T | P | C |
| P18ITT05 | NATURAL LANGUAGE PROCESSING | 3 | 0 | 0 | 3 |
| | | | | | |

Internal Marks : 40

External Marks: 60

NATURAL LANGUAGE PROCESSING

Prerequisites: Data structures, finite automata and probability theory

Course Objectives

1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms
5. Able to design different language modeling Techniques.

UNIT – I

(9 Lectures)

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT – II

(9 Lectures)

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT – III

(4 Lectures)

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT – IV

(4 Lectures)

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT – V

(9 Lectures)

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter

Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

| Course Code | Course Name | Course Structure | | | |
|-------------|------------------|------------------|---|---|-----|
| P18ITL06 | DATA SCIENCE LAB | L | T | P | C |
| | | 0 | 0 | 0 | 1.5 |

Internal Marks : 40

External Marks: 60

DATA SCIENCE LAB

Course Objectives:

1. To introduce students to the valuable concepts of numpy, pandas and matplotlib in Data Science .
2. To develop analyzing skills to the students for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

1. Develop basic programs in Python.
2. Practice and Implement different kinds of Lists, Data Frame, Dictionaries
3. Create dataset and analyze the data by using numpy and pandas.
4. Design different types of plots by using mat plotlib by using dataset.

Experiments:

1. Installation and run Anaconda software.
2. Python Program to find ASCII value of given number.
3. Python Program to Make a Simple Calculator.
4. Python Program to Count the Number of Each Vowel.
5. Python Program to Illustrate Different Set Operations.
6. Create List and apply different functions on it.
7. Create a tuple and apply different built-in functions on it.
8. Apply different string operations.
9. Create a dictionary and apply different operations like accessing, updating and deleting.
10. Create Data Frames and apply merge and join functions on it.
11. Create a Village Dataset and execute the below conditions:
 - a) Check for any null values in the given dataset if you find any please remove them and continue to further tasks .
 - b) Calculate the count of people living in hut and using smart TV.

- c) Count the people using the different type of toilets in all villages.
- d) For every village and for each and every income group count the number of illiterates.
- e) What is the Proportion of House Holds getting the income through Business did not understand GST.
- f) How Many people having Smartphone and aware of digital fraud.
- g) What is the ratio of Business Income Groups to Other Income Groups in using PHC.

12. Design different types of plots by using above dataset

- a) Plot the Scatter plot Graph for the values obtained in 11.
- b) Plot pie chart for the values across different villages obtained in 11
- c) Plot the Bar Graph for the Values Obtained in 11
- d) by using

| Course Code | Course Name | Course Structure | | | |
|-------------|----------------------|------------------|---|---|-----|
| P18CSL09 | WEB TECHNOLOGIES LAB | L | T | P | C |
| | | 0 | 0 | 3 | 1.5 |

Internal Marks : 40

External Marks: 60

WEB TECHNOLOGIES LAB

Course Prerequisites: Java Programming

1. To develop an ability to design and implement static and dynamic website
2. Choose best technologies for solving web client/server problems
3. Create conforming web pages
4. Use JavaScript for dynamic effects
5. To prepare PHP scripts
6. Use JavaScript & PHP to validate form input entry
7. Understand, analyze and build web applications using PHP

Course Outcomes:

1. Create a static web pages using HTML and CSS.
2. Develop JavaScript code for data validation.
3. Integrate frontend and backend technologies in client-server systems.
4. Design dynamic web applications using PHP and JSP.
5. Demonstrate database connectivity for developing web applications.

List of Experiments

Experiment 1: Design the following static web pages required for a Training and placementcell web site.

1) Home Page 2) Login Page 3) Registration page

Experiment 2: 4) Company Details Page 5) Alumni Details Page 6) Placement Staff DetailsPage

Experiment 3: 7) Student personal Info Page 8) Student Academic Info page 9) SemesterWise Percentage & their Aggregate page

Experiment 4: Validate login page and registration page using regular expressions.

Experiment 5: Apply different font styles, font families, font colors and other formatting styles to the above static web pages.

Experiment 6: Install wamp server and tomcat server, access above developed static web pages using these servers.

Experiment 7: Write a servlet/PHP to connect to the database, Insert the details of the

users who register with the web site, whenever a new user clicks the submit button in the registration.

Experiment 8: Write a JSP/PHP to connect to the database, Insert the details of the student academic information with student academic info page.

Experiment 9: User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following.

1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user (i.e., user-name and password match) you should welcome him by name(user-name) else you should display "You are not an authenticated user".

Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the get in parameters' method.

Experiment 10: write a JSP to insert the student's semester wise percentages and calculate aggregate and insert into database.

| Course Code | Course Name | Course Structure | | | |
|-------------|----------------------|------------------|---|---|---|
| P18CSL09 | WEB TECHNOLOGIES LAB | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

IOT

Pre-requisite of course: Fundamentals of computer network, Network Security, internet technology.

Course Objective:

- understand the concepts of Internet of Things and able to build lot applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.
- Student will explore various components of Internet of things such as Sensors, internetworking and cyber space. In the end they will also be able to design and implement IOT circuits and solutions.

Course Outcomes: After successful completion of this course, student will be able to

- Understand general concepts of Internet of Things (IOT) (Understand)
- Recognize various devices, sensors and applications (Knowledge)
- Apply design concept to IOT solutions (Apply)
- Analyze various M2M and IOT architectures (Analyze)
- Evaluate design issues in IOT applications (Evaluate)
- Create IOT solutions using sensors, actuators and Devices (Create)

UNIT– I

(9 Lectures)

Introduction to IOT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IOT Definition, Characteristics. IOT Functional Blocks, Physical design of IOT, Logical design of IOT, Communication models & APIs

UNIT – II

(9 Lectures)

M2M to IOT-The Vision-Introduction, From M2M to IOT, M2M towards IOT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IOT Value Chains, An emerging industrial structure for IOT

UNIT-III

(9 Lectures)

M2M vs IOT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IOT architecture outline, standards considerations. Reference Architecture and Reference Model of IOT

UNIT-IV**(10 Lectures)**

IOT Reference Architecture- Getting Familiar with IOT Architecture, Various architectural views of IOT such as Functional, Information, Operational and Deployment. Constraints affecting design in IOT world- Introduction, Technical design Constraints.

Domain specific applications of IOT: Home automation, Industry applications, Surveillance applications, Other IOT application

UNIT- V**(9 Lectures)**

Developing IOT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IOT.

Text Books:

1. Jan Holler, Vlasios Tsiatsis, 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.

References:

1. Jan Holler, Vlasios Tsiatsis, 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 Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014
3. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
4. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1

| Course Code | Course Name | Course Structure | | | |
|-------------|--------------------|------------------|---|---|---|
| P18CSL09 | BIG DATA ANALYTICS | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks : 40

External Marks: 60

BIG DATA ANALYTICS

Course Objectives:

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hadoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Course Outcomes:

The students will be able to:

- Identify Big Data and its Business Implications.
- List the components of Hadoop and Hadoop Eco-System
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Analyze Info sphere Big Insights Big Data Recommendations.
- Apply Machine Learning Techniques using R.

Pre- requisites: Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

UNIT- I: INTRODUCTION TO BIG DATA AND HADOOP

(9 Lectures)

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Info sphere Big Insights and Big Sheets.

UNIT- II : HDFS(Hadoop Distributed File System)

(9 Lectures)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT- III : Map Reduce

(9 Lectures)

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

UNIT- IV : Hadoop Eco System**(9 Lectures)**

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase : Basics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

UNIT- V : Data Analytics with R**(4 Lectures)**

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big.

Text Books

- Tom White “Hadoop: The Definitive Guide” Third Edition, O’Reilly Media, 2012.
- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
- Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
- Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
- Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- Glen J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
- Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
- Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
- Arvind Sati, “Big Data Analytics: Disruptive Technologies for Changing the Game”, MC Press, 2012
- Paul Zinkopoulos, Dirk De Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.

| Course Code | Course Name | Course Structure | | | |
|-------------|------------------|------------------|---|---|-----|
| P18ITL06 | DATA SCIENCE LAB | L | T | P | C |
| | | 0 | 0 | 3 | 1.5 |

Internal Marks : 40

External Marks: 60

DATA SCIENCE LAB

Course Objectives:

4. To introduce students to the valuable concepts of jumpy, pandas and matplotlib in Data Science .
5. To develop analyzing skills to the students for solving practical problems.
6. To gain experience of doing independent study and research.

Course Outcomes:

1. Develop basic programs in Python.
2. Practice and Implement different kinds of Lists, Data Frame, Dictionaries
3. Create dataset and analyze the data by using jumpy and pandas.
4. Design different types of plots by using mat plot lib by using dataset.

Experiments:

13. Installation and run Anaconda software.
14. Python Program to find ASCII value of given number.
15. Python Program to Make a Simple Calculator.
16. Python Program to Count the Number of Each Vowel.
17. Python Program to Illustrate Different Set Operations.
18. Create List and apply different functions on it.
19. Create a tuple and apply different built-in functions on it.
20. Apply different string operations.
21. Create a dictionary and apply different operations like accessing, updating and deleting.
22. Create Data Frames and apply merge and join functions on it.
23. Create a Village Dataset and execute the below conditions:
 - a) Check for any null values in the given dataset if you find any please remove them and continue to further tasks .
 - b) Calculate the count of people living in hut and using smart TV.

- c) Count the people using the different type of toilets in all villages.
- d) For every village and for each and every income group count the number of illiterates.
- e) What is the Proportion of House Holds getting the income through Business did not understand GST.
- f) How Many people having Smartphone and aware of digital fraud.
- g) What is the ratio of Business Income Groups to Other Income Groups in using PHC.

24. Design different types of plots by using above dataset

- a) Plot the Scatter plot Graph for the values obtained in 11 (b).
 - b) Plot pie chart for the values across different villages obtained in 11 (c).
- Plot the Bar Graph for the Values Obtained in 11 (d) by using

| Course Code | Course Name | Course Structure | | | |
|-------------|---------------------|------------------|---|---|---|
| P18ITL06 | OPERATIONS RESEARCH | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Internal Marks: 40

External Marks: 60

OPERATIONS RESEARCH

Course Objectives:

- Understanding the mathematical importance of development of model in
- A particular optimization model for the issue and solving it.

Course Outcomes:

- Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization Tech

UNIT – I :

(9 Lectures)

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II:

(9 Lectures)

Transportation Problem – Formulation – Optimal solution, unbalanced transportation Problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III:

(9 Lectures)

Sequencing – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs Through three machines – Job shop sequencing – two jobs through ‘m’ machines-graphical Model. Replacement: Introduction – Replacement of items that deteriorate with time – when Money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV:

(9 Lectures)

Theory of Games: Introduction –Terminology– Solution of games with saddle points and Without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - Dominance principle.

Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory Models with one price break and multiple price breaks –Stochastic models – demand discrete Variable or continuous variable – Single Period model with no setup cost.

UNIT – V:

(9 Lectures)

Waiting Lines: Introduction–Terminology-Single Channel–Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming: Introduction – Terminology- Bellman’s Principle of Optimality – Applications of dynamic programming- shortest path problem – 1

TEXT BOOKS:

1. Operations Research / N.V.S. Raju / SMS
2. Operations Research / ACS Kumar / Yes Dee

REFERENCE BOOKS:

1. Operations Research /J. K. Sharma / Macmillan.
2. Operations Research /A. M. Natarajan, P. Bala subramaniam, A. Tamilarasi / Pearson.



PACE INSTITUTE OF TECHNOLOGY & SCIENCES
(Autonomous)

NH-16, Near Valluramma Temple, Ongole -523272
Accredited by NAAC with 'A' Grade and NBA

Minutes of Sixth BOS Meeting
held on 30th December 2022

The 6th Board of Studies Meeting of the Department of Artificial Intelligence and Data Science(AIDS) was held on 30.12.2022 through online at PACE Institute of Technology and Sciences at 11:00 a.m.

Agenda of BoS:

- Welcome note by BoS Chairman.
- Review the previous BoS meeting minutes
- Community Service Certificate
- Honour Degree and Minor Degree
- Discussion on Vision, Mission, Pos and PEOs.
- Discussion on the Performance of previous semester.
- Any other point of academic excellence.

The following members were present:

| S.No. | Name of the BOS Member | Designation | Representative in BOS | Signature |
|-------|------------------------|--|---|-----------|
| 1. | Dr. A. Krishna Mohan | Professor Dept. of CSE, University College of Engineering Kakinada JNTUK Kakinada | Expert from Parent University | |
| 2. | Dr. R.B.V. Subramanyam | Professor, Department of CSE, NIT Warangal | Expert from Outside Parent University | |
| 3. | Dr V Persis | Professor Dept of CSE, Adikavi Nannaya University Rajahmundry | Expert from Outside Parent University | |
| 4. | Mr.CH Vamsi Krishna | Assistant Vice President, Development Bank of Singapore, Hyderabad | Expert from Industry | |
| 5. | Mr.N.Sai Vamsi Kumar | Senior QA Automation Engineer, Lotus Wave Software Solutions Pvt.Ltd., | Postgraduate Meritorious Alumni | |