PACEINSTITUTEOFTECHNOLOGY&SCIENCES,ONGOLE–523272 (AUTONOMOUS)
AR-18 REGULATIONS B.Tech COURSE STRUCTURE
B.Tech Artificial Intelligence and Machine Learning

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	**P18CST03**	Mathematical Foundations of Computer Science	3	1	0	4	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**	**2**	**09**	**21.5**	**420**	**480**

II YEAR II SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	**P18BST04**	Probability & Statistics	3	0	0	3	40	60
2	**P18CST09**	Operating systems	3	0	0	3	40	60
3	**P18AMP02**	R Programming	2	0	2	3	40	60
4	**P18CST06**	Database Management Systems	3	1	0	4	40	60
5	**P18AMP01**	Foundation of AI	3	0	0	3	40	60
6	**P18ECO02**	***Open Elective – I***	2	0	0	2	40	60
7	**P18AML02**	OS Lab	0	0	2	1.5	40	60
8	**P18CSL05**	Database Management Systems Lab	0	0	2	1.5	40	60
9		Internship	0	0	0	2	100	-
10	**P18MCT03**	Indian Constitution	3	0	0	0	100	-
Total Periods			**19**	**1**	**6**	**23**	**420**	**480**

III YEAR I SEMESTER								
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		Web Technologies	3	0	0	3	40	60
5		**Professional Elective – I**	3	0	0	3	40	60
6		***Open Elective-II***	2	0	0	2	40	60
7		Design thinking	0	0	4	2	40	60
8		Machine Learning Lab	0	0	3	1.5	40	60
9		Web Technologies Lab	0	0	3	1.5	40	60
Total Periods			**17**	**0**	**10**	**22**	**360**	**540**

Professional Elective – I		
S.No	**Course Code**	**COURSE**
i)		Distributed Systems
ii)		Software Testing
iii)		Automata Theory and Compiler Design
iv)		Data Warehousing & Data Mining

Open Elective – II		
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		Deep Learning	3	0	0	3	40	60

3		Cryptography & Network Security	3	0	0	3	40	60
4		Data Analytics And Visualization	3	0	0	3	40	60
5		**Professional Elective-II**	3	0	0	3	40	60
6		***Open Elective –III***	2	0	0	2	40	60
7		Deep Learning Lab	0	0	2	1.5	40	60
8		Data Visualization Techniques Lab	0	0	2	1.5	40	60
9		Mini Project	0	0	6	2	40	60
Total Periods			**17**	**0**	**10**	**22**	**360**	**540**

Professional Elective – II		
S.No	**Course Code**	**COURSE**
i)		Medical Image Analysis
ii)		Social Media Analytics
iii)		Devops
iv)		Wireless & Adhoc Networks

Open Elective – II		
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		Evolutionary Computation	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		***Open Elective-IV***	2	0	0	2	40	60
6		Bigdata Analytics Lab	0	0	3	1.5	40	60

7		OOAD with UML Lab	1	0	4	3	40	60
8		Employability Skills	0	0	2	0	100	
9		Mini Project	0	0	6	3	100	-
Total Periods			**15**	**0**	**15**	**21.5**	**480**	**420**

Professional Elective – III		
S.No	**Course Code**	**COURSE**
i)		Natural Language Processing
ii)		No SQL Data Bases
iii)		Service oriented Architecture
iv)		IoT

Professional Elective – IV		
S.No	**Course Code**	**COURSE**
i)		Multimedia Application Development
ii)		Block chain Technologies
iii)		Soft Computing Techniques
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**

Professional Elective – V		
S.No	**Course Code**	**COURSE**
i)		Intrusion Detection System
ii)		Information Retrieval Systems
iii)		Robotics Process Automation
iv)		Computational Neuro Science

Professional Elective – VI		
S.No	**Course Code**	**COURSE**
i)		Cognitive Science
ii)		Applied AI
iii)		Cyber Security
iv)		Quantum Computing

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

Internal Marks : 40
External Marks: 60

DATA SCIENCE

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**

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 Le**

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 Schutt. 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, Anand 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			
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. 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- IV **(9 Lectures)**

Course Code	Course Name	Course Structure

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.

P18CSE08	CNS	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. Analyse the security mechanisms for achieving authentication.
4. Analyse 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)**

Course Code	Course Name	Course Structure

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, Withman , Thomson.
3. Introduction to Cryptography, Buchmann, 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

P18CSE08	WIRELESS &ADHOC NETWORKS	L	T	P	C
		3	0	0	3

Internal Marks : 40
External Marks: 60

WIRELESS &ADHOC NETWORKS

Course Objectives:

- 1. To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

Course Outcomes:

- 1. Identify different issues in wireless ad hoc and sensor networks.
- To analyze protocols developed for ad hoc and sensor networks.
- To identify and understand security issues in ad hoc and sensor networks.

UNIT- I MAC & ROUTING IN AD HOC NETWORKS (9 HOURS)

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple-Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols

UNIT -II TRANSPORT & QOS IN AD HOC NETWORKS (9 HOURS)

TCP‟s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT -III MAC & ROUTING IN WIRELESS SENSOR NETWORKS(9 HOURS)

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols

UNIT- IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples

UNIT- V SECURITY IN AD HOC AND SENSOR NETWORKS

Course Code	Course Name	Course Structure

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, ―Ad Hoc Wireless Networks – Architectures and 2 Protocols‖, Pearson Education, 2006.
2. Holger Karl, Andreas Willing, ―Protocols and Architectures for Wireless Sensor Networks‖, John Wiley & Sons, Inc., 2005.

REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, ―Ad Hoc Mobile Wireless Networks‖, Auerbach Publications, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ―Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition)‖, World Scientific Publishing, 2011.

3. Waltenegus Dargie, Christian Poellabauer, ―Fundamentals of Wireless Sensor Networks Theory and Practice‖, John Wiley and Sons, 2010
4. Xiang-Yang Li , "Wireless Ad Hoc and Sensor Networks: Theory and Applications‖, 1227 th edition, Cambridge university Press,2008.

P18CSE08	DAV	L	T	P	C
		3	0	0	3

Internal Marks: 40
External Marks: 60

DATA ANALYTICS AND VISUALIZATION

Course Objectives:

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

Course Outcomes:

After completing the course, student will be able to:

i. Present data with visual representations for your target audience, task, and data;
ii. Identify appropriate data visualization techniques given particularrequirements imposed by the data;

UNIT -1: INTRODUCTION AND TABLEAU PRIMER:

Introduction to data visualization Data for data graphics Tableau introduction

UNIT-2:DESIGN PRINCIPLES

Design principles Categorical, time series, and statistical data graphics

UNIT-3: Display types,Geospatial displays, Interactivity
Storytelling Multivariate displays, Geospatial displays, Dashboards, interactive and animated displays

UNIT-4:

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-5:

Basic analysis techniques

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

iii. Display types, Geospatial displays, Interactivity
iv. Data Definitions and Analysis Techniques
v. Implement the analytic algorithms and Basic analysis techniques

Text Books:

1. Sosulski, K. (2018). Data Visualization Made Simple: Insights into BecomingVisual. New York: Routledge.
2. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
3. 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
Optional readings:
1. Few, S. (2012). Show me the numbers: Designing tables and graphs toenlighten. Burlingame, CA: Analytics Press.
2. Few, S. (2006). Information dashboard design: The effective visualcommunication of data. Sebastopol: O'Reilly.
3. Ware, C & Kaufman, M. (2008). Visual thinking for design. Burlington: MorganKaufmann Publishers.
4. Wong, D. (2011). The Wall Street Journal guide to information graphics: The dosand don'ts of presenting data, facts and figures. New York: W.W. Norton& Company.
5. Yau, N. (2011). Visualize This: The FlowingData Guide to Design, Visualization,and Statistics. Indianapolis: O'Reilly.
6. Yau, N. (2013). Data Points: Visualization that means something. Indianapolis: O'Reilly.

Internal Marks : 40

External Marks: 60

Course Code	Course Name	Course Structure			
		L	T	P	C
P18CSE08	MS	3	0	0	3

MANAGEMENT SCIENCE

COURSE OBJECTIVES:

- To understand the application of management science in decision making process& its importance, evaluation of management thought, how organisation 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 organisation 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.
- Able to apply PPC techniques, Quality Control, Work-study principles in industry.
- 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 **(9 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. Hitt and Vijaya Kumar: Starategic 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%20Scie nce.pdf
2. https://books.askvenkat.org/management-science-textbook-aryasri-pdf/
3. https://nptel.ac.in/courses/122/102/122102007/
4. https://nptel.ac.in/courses/122/108/122108038/
5. http://www.universityofcalicut.info/SDE/Management_science_corrected_on13Ap ril2016.pdf

Internal Marks: 40

Course Code	Course Name	Course Structure			
P18CSE08	ADHOC & SENSOR NETWORKS	L	T	P	C
		3	0	0	3

External Marks: 60

ADHOC & SENSOR NETWORKS

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: AMRoute, MCEDAR.

UNIT – III **(9 Lectures)**

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad Hoc

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.

Course Code	Course Name	Course Structure

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

P18CSE08	MEDICAL IMAGE ANALYSIS	L	T	P	C
		3	0	0	3

Internal Marks: 40
External Marks: 60

MEDICAL IMAGE ANALYSIS

Course Objectives:

- After taking the course, the student canExplain the basics of medical image enhancement, segmentation and registration methods.
- Describe assumptions and needs behind medical applications (image analysis vs. Medical image analysis),

Course Outcomes:

- Choose image analysis methods for solving specific medical image analysis problems,
- Implement simple medical image analysis algorithms,
- Validate image analysis methods, and
- Read critically literature on the topic.

UNIT – I **(9 Lectures)**

Digitized Image Functions: Dirac distributions, convolution, Fourier transform, Images as linear system. Image digitization, sampling, Quantization, color images. Digital image properties, Metric and topological properties, Histogram visual perception, Image quality, Noise. Nature of Biomedical images, Objectives of biomedical image analysis, Difficulties in biomedical image acquisition and analysis.

UNIT – II **(9 Lectures)**

Image Enhancement: Contrast manipulation, histogram equalization, Laplacian derivatives, Sobel and Kirsch operators, rank operators –textural analysis. Image pre processing – pixel brightness transformations, Geometric transformations, local pre processing, Image restoration. Imaging filters. Biomedical applications.

UNIT – III **(9 Lectures)**

Thresholding and Segmentation: Detection methods, optimal thresholding, multi-spectral thresholding. Edge based segmentation, Region based segmentation, Matching, Advanced optimal border and surface detection approaches.

UNIT – IV **(10 Lectures)**

Restoration: Deterministic, geometric linear filtration, inverse filtering, power spectrum equalization, stochastic. Wiener filtering. Registration, anatomy based, object based, scene based. Biomedical applications.

UNIT – V **(10 Lectures)**

Image Reconstruction: Image reconstruction from projections, Radon transform, Methods for generating projection data, Transmission tomography, Reflection tomography, Emission tomography, Magnetic resonance imaging, Fourier slice theorem, Back-projection theorem. Image Coding and Compression: Lossy verses lossless compression, Fundamental concepts of coding, Image coding and compression standards, biomedical applications

TEXT BOOKS:

- John C Russ, "The image processing handbook", CRC and IEEE press, 1999.
- Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image processing, analysis and machine vision", 2nd Edition, Brooks Cole publishing Co., 1999.

REFERENCE BOOKS:

- Jayaram, Kudupa and Gabor,T Herman, "3D imaging in medicine", 2nd Edition, CRC press, 2000.
- Craig A.Hindley," Practical image processing in C", John Wiley and Sons, 1991.
- R C Gonzalez, Wintz Paul, "Digital Image Processing", Addision Wesley, 2nd Edition, 1987.
- A K Jain, "Fundamental of Digital Image Processing", Prentice Hall, 2002.
- Rangaraj M. Rangayyan, "Biomedical Image Analysis", CRC Press, 2000.
- Sid-Ahmed Maher A, "Image Processing Theory, Algorithms and Architecture", McGraw Hill, 1994.

Internal Marks: 40
External Marks: 60

Course Code	Course Name	Course Structure			
P18CSE08	DEVOPS	L	T	P	C
		3	0	0	3

DEVOPS

Course Objectives:

The main objectives of this course are to

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
3. Implement automated system update and DevOps lifecycle

Course Outcomes:

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

1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices
6. Collaborate and adopt Devops in real-time projects

UNIT – I (9 Lectures)

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT – II (9 Lectures)

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT – III (9 Lectures)

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT – IV (10 Lectures)

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures..

UNIT – V (10 Lectures)

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:
1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison

Internal Marks: 40

Course Code	Course Name	Course Structure			
P18CSE08	SMA	L	T	P	C
		3	0	0	3

External Marks: 60

SOCIAL MEDIA ANALYTICS

Course Objectives:

Exposure to various web and social media analytic techniques.

Course Outcome:

- Knowledge on decision support systems.
- Apply natural language processing concepts on text analytics.
- Understand sentiment analysis.
- Knowledge on search engine optimization and web analytics.

UNIT – I **(9 Lectures)**

An Overview of Business Intelligence, Analytics, and Decision Support: Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics.

UNIT – II **(9 Lectures)**

Text Analytics and Text Mining: Machine Versus Men on Jeopardy!: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools.

UNIT – III **(9 Lectures)**

Sentiment Analysis: Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics.

UNIT – IV **(9 Lectures)**

Web Analytics, Web Mining: Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools.

UNIT – V **(9 Lectures)**

Social Analytics and Social Network Analysis: Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics.

Prescriptive Analytics – Optimization and Multi-Criteria Systems: Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking.

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 / MacMilan.
2. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi / Pearson.

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

Task-1: Introduction to Tableau

- Course introduction
- Dataviz best practices
- Getting started with Tableau Desktop
- Connecting to the tutorial dataset
- Creating the first charts
- Filtering and sorting data **Task-2: Common charts**
- Creating common visualizations (bar charts, line charts etc.)
- Assembling a dashboard layout
- Using dashboard filters

Task-3: Transform the data

- Dataviz best practices
- Creating simple calculations in Tableau
- Using table calculations

Task-4: Interactions

- Interactivity with text and visual tooltips
- Interactivity with actions (filter, highlight, URL)
- Drilldown between dashboards

Task-5: Advanced visualizations

- Dataviz best practices

- Creating more advanced chart types
- Using multiple source tables

Task-6: Data Storytelling

- Intro to data storytelling
- Creating a data story in Tableau
- Overview of the Tableau ecosystem
- Further learning opportunities **System Requirements:**
- System requirements are listed here under Tableau Desktop and Tableau Prep: https://www.tableau.com/products/techspecs
- The latest version of Tableau Desktop as well as Tableau Prep should be downloaded and installed from here: https://www.tableau.com/tft/activation
-

TEXTBOOK:

Visualization Analysis & Design by Tamara Munzner (2014) (ISBN 9781466508910)

REFERENCES BOOKS:

1. Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017)
2. D3.js in Action by Elijah Meeks 2nd Edition (2017)
3. Semiology of Graphics by Jacques Bertin (2010)
4. The Grammar of Graphics by Leland Wilkinson
5. ggplot2 Elegant Graphics for Data Analysis by Hadley Wickham

Internal Marks : 40

Course Code	Course Name	Course Structure			
P18CSL09	DEEP LEARNING LAB	L	T	P	C
		0	0	3	1.5

External Marks: 60

DEEP LEARNING LAB

Course Objectives

1. Implement the various deep learning algorithms in Python.
2. Learn to work with different deep learning frameworks like Keras, Tensor flow, PyTorch, Caffe etc.

Course Outcome

Expert knowledge in solving real world problems using state-of-art deep learning techniques

List of Exercises / Experiments

1. Basic image processing operations: Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
2. Implement SVM/Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network
3. Study the effect of batch normalization and dropout in neural network classifier
4. Familiarization of image labeling tools for object detection, segmentation
5. Image segmentation using Mask RCNN, UNet, SegNet
6. Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
7. Image Captioning with Vanilla RNNs
8. Image Captioning with LSTMs
9. Network Visualization: Saliency maps, Class Visualization
10. Generative Adversarial Networks
11. Chatbot using bi-directional LSTMs
12. Familiarization of cloud based computing like Google colab

References

1. Francois Chollet, “Deep learning with Python” – Manning Publications

Internal Marks: 40

Course Code	Course Name	Course Structure			
P18CSL09	OR	L	T	P	C
		3	0	0	3

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 Outcome:

- 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 – l

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 / MacMilan.
2. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi / Pearson.

Internal Marks : 40

Course Code	Course Name	Course Structure			
CS525PE	NLP	L	T	P	C
		3	0	0	3

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 **(9 Lectures)**

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

UNIT – IV **(9 Lectures)**

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT – V **(9 Lectures)**

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension 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 Crosslingual 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

The following BOS Members approved the 2nd year R18 regulation syllabus for the UG course Artificial Intelligence and Machine Learning

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	