ACE
Engineering College
An Autonomous Institution
(NBA ACCREDITED B.TECH COURSES, ACCORDED NAAC 'A'GRADE)
Ghatkesar, Hyderabad- 501 301

R22 - B.TECH. FOUR YEAR DEGREE COURSE
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE - SYLLABUS

IV Year II Semester - Regulation R22

S.No.	Course Code	Course Title	Periods Per Week			Credits
			L	T	P	
1	SM801MS	Organizational Behaviour	3	0	0	3
		Professional Elective - VI				
2	CS861PE	Computational Complexity	3	0	0	3
	CS862PE	Distributed Systems				
	CS863PE	Deep Learning				
	CS864PE	Human Computer Interaction				
	CS865PE	Cyber Forensics				
3		Open Elective - III	3	0	0	3
4	CS801PC	Project Stage - II including Seminar	0	0	22	11
		Total Credits	**9**	**0**	**22**	**20**

Open Elective -3:

1. CS831OE: Algorithms Design and Analysis
2. CS832OE: Introduction to Computer Networks

CS801PC: ORGANIZATIONAL BEHAVIOUR

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- This course demonstrates individual, group behavior aspects: The dynamics of organizational climate, structure and its impact on Organizations.

Course Outcomes:

- Students understand their personality, perception and attitudes for overall development and further learn the importance of group behavior in the organizations.
- Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.
- Critically evaluate the potential effects of important developments in the external environment on organizational behavior.
- Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.
- Manage conflict in organizational context and deal with stress.
- Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

UNIT - I

Organizational Behaviour:

Definition, need and importance of organizational behaviour, Nature and scope, Frame work, Organizational behaviour models.

UNIT - II

Individual Behaviour:

Personality types, Factors influencing personality, Theories, Learning, Types of learners, The learning process, Learning theories, Organizational behaviour modification, Misbehaviour, Types, Management Intervention. Emotions - Emotional Labour, Emotional Intelligence, Theories. Attitudes, Characteristics,Components, Formation, Measurement- Values. Perceptions, Importance, Factors influencing perception, Interpersonal perception- Impression Management. Motivation, importance, Types, Effects on work behavior.

UNIT - III

Group Behaviour:

Organization structure, Formation, Groups in organizations, Influence, Group dynamics, Emergence of informal leaders and working norms, Group decision making techniques, Team building - Interpersonal relations, Communication, Control.

UNIT - IV

Leadership and Power:

Meaning, Importance, Leadership styles, Theories of leadership, Leaders Vs Managers, Sources of power, Power centers, Power and Politics.

UNIT - V

Dynamics of Organizational Behaviour:

Organizational culture and climate, Factors affecting organizational climat , Importance. Job satisfaction, Determinants, Measurements, Influence on behavior. Organizational change, Importance, Stability Vs Change, Proactive Vs Reaction change, the change process, Resistance to change, Managing change. Stress, Work Stressors, Prevention and Management of stress, Balancing work and Life. Organizational development, Characteristics, objectives,. Organizational effectiveness.

TEXT BOOKS:

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

REFERENCE BOOKS:

1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

CS861PE: COMPUTATIONAL COMPLEXITY (Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Design and Analysis of Algorithms.

Course Objectives:

- Introducing computational complexity-based algorithms and their implementations.

Course Outcomes:

- Understand the complexity of time and space for computational models.
- Understand optimizational problems.
- Understand NP completeness problems.
- Understand hierarchical theorems.
- Know and state the relationship between various complexity classes studied in the course.
- State and explain the classical results in computational complexity theory.

UNIT – I

Introduction: Algorithms and complexity, Basic Complexity Classes-Deterministic time and the class P. Computational Tasks and models: Computational tasks – Search problems, Decision problems, Uniform models- Overview, General Principles, Concrete Model, Halting problem, restricted models.

UNIT – II

P vs. NP: Efficient Computation, The Search Version (Finding vs. Checking), The Decision Version (Proving Vs Verifying), Equivalence of the two formulations, Optimal Search Algorithms for NP. **Polynomial time reduction:** The general notation of a Reduction, Reducing Optimization Problems to search problems, Self-Reducibility of search problems

UNIT – III

NP – Completeness: Definition, Cook's theorem, Existence of NP Complete Problems bounded halting and non-halting, Natural NP Complete Problems – The NP completeness of CSAT, The NP Completeness of SAT, Combinatorics and Graph Theory, additional properties of the standard reductions, Negative applications of NP Completeness, Positive applications of NP Completeness, NP Sets, Reflections on Complete problems, NP –complete optimization problems.

UNIT –IV

Diagonalization: Time Hierarchy theorem, Space Hierarchy theorem, Non-deterministic Time Hierarchy theorem, Ladner's theorem.

Space Complexity: Definition of space bounded computation, PSPACE completeness, NL Completeness, some space complexity classes– Savitch's theorem, Savitch's theorem, The essence of PSPACE.

The polynomial time hierarchy and alternations: polynomial hierarchy, time versus alternations, properties of polynomial hierarchy, Complete problems in PH.

UNIT – V

Randomized computation: Probabilistic Turing machine, one sided and zero-sided error, Randomized reduction, Randomized space bounded computation.

Decision Trees: Graphs and Decision Trees, Monotonic Graph properties, Topological criterion, Randomized decision trees.

TEXT BOOKS:

1. The Basics of Computational Complexity, Oded Goldreich, Cambridge University Press.
2. Computational Complexity: A Modern Approach, Sanjeev Arora and Boaz Barak, Princeton University.

REFERENCE BOOKS:

1. Computational Complexity, by Christos Papadimitriou.
2. Theory of Computational Complexity, Ding-Zhu Du, Ker-I Ko, WILEY.

CS862PE: DISTRIBUTED SYSTEMS (Professional Elective –VI)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Prerequisites:

1. A course on "Operating Systems".
2. A course on "Computer Organization & Architecture".

Course Objectives:

- To provide an insight into Distributed systems.
- To introduce concepts related to Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory.

Course Outcomes:

- Understand Transactions and Concurrency control.
- Understand distributed shared memory.
- Design a protocol for a given distributed application.
- Apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, voting etc.
- Analyze fault tolerance and recovery in distributed systems and algorithms for the same.
- Analyze the design and functioning of existing distributed systems and file systems.

UNIT - I

Characterization of Distributed Systems: Examples of Distributed systems, Resource sharing and web, challenges.

System models: Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication.

Distributed objects and Remote Invocation: Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT - II

Operating System Support: OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture.

Distributed File Systems: Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems: Napster and its legacy, Peer to Peer middleware

Time and Global States: Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement: Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions

Distributed deadlocks: Transaction recovery.

UNIT - V

Replication: Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

Distributed shared memory: Design and Implementation issues, Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

CS863PE: DEEP LEARNING (Professional Elective –VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To understand deep Learning algorithms and their applications in real-world data.

Course Outcomes:

- Understand machine learning basics and neural networks.
- Understand optimal usage of data for training deep models.
- Apply CNN and RNN models for real-world data.
- Evaluate deep models.
- Develop deep models for real-world problems.
- Design and deploy simple TensorFlow-based deep learning solutions to classification problems.

UNIT -I

Machine Learning Basics:

Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT -II

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, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

UNIT-III

Convolutional Networks:

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.

UNIT -IV

Recurrent and Recursive Nets:

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The

Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory.

UNIT -V

Practical Methodology:

Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition.

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOK:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G., H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

CS864PE: HUMAN COMPUTER INTERACTION (Professional Elective –VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To gain an overview of Human-Computer Interaction (HCI).
- Understanding the alternatives to traditional "keyboard and mouse" computing.
- Getting familiarity with the vocabulary associated with sensory and cognitive systems.
- Be able to apply models from cognitive psychology to predicting user performance.
- Working in small groups on a product design with invaluable team-work experience.

Course Outcomes:

- Apply HCI and principles to interaction design.
- Design certain tools for blind or PH people.
- Understand the social implications of technology and ethical responsibilities as engineers.
- Understand the importance of a design and evaluation methodology.
- Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
- Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

UNIT - I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design, A brief history of Screen design.

The graphical user interface: popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics, Principles of user interface.

UNIT - II

Design process: Human interaction with computers, importance of human characteristics, human consideration, Human interaction speeds, understanding business junctions.

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information , focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

UNIT- III

Windows: New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components, text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.

UNIT- IV

HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping.

Design Focus: Prototyping in practice, Design rationale, Design rules, Principles to support usability Standards, Golden rules and heuristics, HCI patterns, Evaluation techniques, Goals of evaluation,

Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method, Universal design, Universal design principles Multimodal interaction

UNIT- V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures, Ubiquitous computing and augmented realities, Ubiquitous computing applications research.

Design Focus: Ambient Wood – augmenting the physical, Virtual and augmented reality, Shared experience Design Focus: Applications of augmented reality Information and data visualization.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech.
2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gregory's, Abowd, Russell Bealg, Pearson Education.

REFERENCE BOOKS:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen, Pearson Education.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

CS865PE: CYBER FORENSICS (Professional Elective –VI)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Prerequisites: Network Security.

Course Objectives:

- A brief explanation of the objective is to provide digital evidence which is obtained from digital media.
- In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computers play in a certain crime.
- According to a snippet from the United States Security Service, the computer functions in different kinds of crimes.

Course Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics.
- Apply a number of different computer forensic tools to a given scenario.
- Understand the basics of computer forensics.
- Analyze and validate digital evidence data.
- Analyze acquisition methods for digital evidence related to system security.

UNIT- I

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response, Phase after detection of an incident.

UNIT- II

Initial Response and forensic duplication: Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system.

Forensic Duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive.

UNIT- III

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions.

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT- IV

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations:

Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT- V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.

REFERENCE BOOKS:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education.
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.

CS831OE: ALGORITHMS DESIGN AND ANALYSIS (Open Elective –III)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Programming for problem solving and Data Structures

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate.
- Describes how to evaluate and compare different algorithms using worst, average, and best case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:

- Analyze performance of Algorithms using Asymptotic Notations.
- Design and Analyze the algorithms for solving complex problems using Divide-and-Conquer, backtracking, Greedy, Dynamic Programming and Branch & Bound Techniques.
- Choose appropriate data structures and algorithm design methods for a specified application
- Explain how the choice of data structures and the algorithm design methods impact the performance of programs.
- Find the optimal solution of complex problems in Graphs.
- Develop profound understanding of P,NP,NP-Hard and NP-Complete problems.

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort.

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV

Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

CS832OE: INTRODUCTION TO COMPUTER NETWORKS (Open Elective – III)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on "Programming for problem solving".
2. A course on "Data Structures".

Course Objectives:

- Equip the students with the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes:

- Understand and Contrast the concept of Signals, OSI & TCP/IP reference models and discuss the functionalities of each layer in these models.
- Discuss and Analyze flow control and error control mechanisms and apply those using standard data link layer protocols.
- Design subnets and calculate the IP addresses to fulfill network requirements of an organization.
- Analyze and apply various routing algorithms to find shortest paths for packet delivery.
- Explain the details of Transport Layer Protocols (UDP, TCP) and suggest appropriate protocol in reliable/unreliable communication.
- Analyze the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

UNIT – I

Introduction:
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission.

Data link layer: Design issues, framing, Error detection and correction.

UNIT - II

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V

Application Layer: Domain name system, Electronic Mail, the World Wide Web, HTTP, Streaming audio and video.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 6th Edition. Pearson Education.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.