

Teaching Scheme of B.Tech.-III (CSE) (Semester V)

| Sr. No. | Course | Code | Credit | Teaching Scheme | | | Examination Scheme | | | Total |
|---------|--|-------|-----------|-----------------|----------|----------|--------------------|-----------|------------|------------|
| | | | | L | T | P | L | T | P | |
| 1 | Operating Systems (Core-9) | CS301 | 5 | 3 | 1 | 2 | 100 | 25 | 50 | 175 |
| 2 | Computer Networks (Core-10) | CS303 | 5 | 3 | 1 | 2 | 100 | 25 | 50 | 175 |
| 3 | Professional Ethics, Economics and Business Management | HU303 | 4 | 4 | 0 | 0 | 125 | 0 | 0 | 125 |
| 4 | Institute Elective-1 | - | 3 | 3 | 0 | 0 | 100 | 0 | 0 | 100 |
| 5 | Core Elective-1 | CS3AA | 3 | 3 | 0 | 0 | 100 | 0 | 0 | 100 |
| 6 | Seminar | CS305 | 1 | 0 | 0 | 2 | 0 | 0 | 50 | 50 |
| | Total | | 21 | 16 | 2 | 6 | 525 | 50 | 150 | 725 |
| | Total Contact Hours per week | | | 24 | | | | | | |

Practical Examination Scheme (Internal 50% and External 50%)

Institute Elective-1 (CS3XX):

| | | | |
|---|------------------------------|---|--|
| 1 | Soft Computing (CS361) | 4 | Signals & Systems (CS367) |
| 2 | Information Security (CS363) | 5 | Logic and Functional Programming (CS369) |
| 3 | Machine Learning (CS365) | | |

Core Elective-1 (CS3AA):

| | | | |
|---|--|---|-------------------------------------|
| 1 | Data Science (CS321) | 4 | Information Theory & Coding (CS327) |
| 2 | Advanced Microprocessor (CS323) | 5 | Object Oriented Technology (CS329) |
| 3 | Parallel Processing and Architecture (CS325) | | |

B.Tech. III (CSE) Semester – V
OPERATING SYSTEMS (CORE-9)
CS301

Scheme

| L | T | P | Credit |
|---|---|---|--------|
| 3 | 1 | 2 | 05 |

1. Course Outcomes (COs):

At the end of course, students will be able to

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|-----|---|
| CO1 | understand the significance of operating system in computing devices, exemplify the communication between application programs and hardware devices through system calls. |
| CO2 | compare and illustrate various process scheduling algorithms. |
| CO3 | apply appropriate memory and file management schemes. |
| CO4 | illustrate various disk scheduling algorithms. |
| CO5 | design access control and protection based modules for an operating system. |

2. Syllabus

• **OPERATING SYSTEM OVERVIEW (03 Hours)**

Operating System(OS) Objectives, Evolution, Types, Major Achievements, Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore.

• **PROCESSES AND THREADS (05 Hours)**

Process Concept, Process States, Process Description, Process Control Block, PCB as a Data Structure in Contemporary Operating Systems, Process Hierarchy, Processes vs Threads, Types of Threads, Multicore and Multithreading, Case Study: Linux & Windows Process and Thread Management and its Related System Calls.

• **CONCURRENCY: MUTUAL EXCLUSION AND SYNCHRONIZATION (04 Hours)**

Principles of Concurrency, Mutual Exclusion, Semaphores, Monitors, Message Passing, Readers/Writers Problem.

• **CONCURRENCY: DEADLOCK AND STARVATION (04 Hours)**

Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Dining Philosopher's Problem, Case Study: Linux & Windows Concurrency Mechanism.

• **SCHEDULING (08 Hours)**

Uniprocessor Scheduling: Long Term Scheduling, Medium Term Scheduling, Short Term Scheduling, Scheduling Algorithms: Short Term Scheduling Criteria, Use of Priorities, Alternative Scheduling Policies, Performance Comparison, Fair-Share Scheduling. Multiprocessor Scheduling: Granularity, Design Issue, Process Scheduling, Thread Scheduling, Real-Time Scheduling: Characteristics of RTOS, Real-Time Scheduling, Deadline Scheduling,

Rate Monotonic Scheduling, Priority Inversion. Case Study: Linux & Windows Scheduling.

- **MEMORY MANAGEMENT** (05 Hours)
Memory Hierarchy, Static and Dynamic Memory Allocation, Overview of Swapping, Multiple Partitions, Contiguous and Non-Contiguous Memory Allocation, Concepts of Simple Paging, Simple Segmentation.
 - **VIRTUAL MEMORY** (05 Hours)
Virtual Memory Concepts, Paging and Segmentation using Virtual Memory, Protection and Sharing, Fetch Policy, Placement Policy, Replacement Policy, Resident Set Management, Cleaning Policy, Load Control, Case Study: Linux & Windows Memory Management.
 - **I/O MANAGEMENT AND DISK SCHEDULING** (04 Hours)
I/O Device, Organisation of the I/O Function, Operating System Design Issue, I/O Buffering, Disk Scheduling, RAID, Disk Cache, Case Study: Linux & Windows I/O.
 - **FILE MANAGEMENT** (04 Hours)
Overview of : Files & File Systems, File Structure, File Management Systems, File Organisation and Access, B-tree, File Directories, File Sharing, Record Blocking, Secondary Storage Management, File System Security, Case Study: Linux & Windows File System.
- Tutorials will be based on the coverage of the above topics separately. (14 Hours)**
- Practicals will be based on the coverage of the above topics separately (28 Hours)**
- (Total Contact Time: 42 Hours + 14 Hours + 28 Hours= 84 Hours)**
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3. Tutorials:

- 1 Assignment based on Process scheduling algorithm.
- 2 Questions based on Page replacement algorithm.
- 3 Assignment based on Banker's algorithm.
- 4 Assignment based on Semaphores and monitors.

5. Practicals:

- 1 Introduction to Basic and Advance commands of Linux.
- 2 Introduction to Shell Script and programs based on it.
- 3 Practical based on different Memory management scheme.
- 4 Practical based on different Process scheduling algorithm.
- 5 Practical based on different Disk scheduling algorithm.
- 6 Process synchronization and deadlock.

- 7 Practical based on file management system.
- 8 Practical based on input output device management.

6. Books Recommended:

1. Silberschatz, Galvin and Gagne, "Operating System Concepts", 10/E, John Wiley & Sons, 2018.
2. W. Stallings, "Operating Systems: Internals and Design Principles", 9/E, Pearson Pub., 2017.
3. W Richard Stevens, Stephen A Rago, "Advanced Programming in the UNIX Environment"; 3/E, Addison Wesley Professional, 2013.
4. Kernighan & Pike, "UNIX programming Environment", 2/E, PHI-EEE, 2001.
5. A Tanenbaum, A Woodhull, "Operating Systems - Design and Implementation", 3/E, PHI EEE, 2006.

ADDITIONAL REFERENCE BOOKS

1. Crawley, "Operating Systems - A Design Oriented Approach", 1/E, McGraw Hill, 1998.

B.Tech. III (CSE) Semester – V
COMPUTER NETWORKS (CORE - 10)
CS303

Scheme

| L | T | P | Credit |
|---|---|---|--------|
| 3 | 1 | 2 | 05 |

1. Course Outcomes (COs):

At the end of the course, students will be able to

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|-----|--|
| CO1 | understand computer network models and services offered at different layers of network protocol stack. |
| CO2 | apply knowledge of data communication, data transmission techniques using various transmission media to deliver error free data and communicate with multiple nodes. |
| CO3 | analyse various routing methods to identify effective routing protocols. |
| CO4 | evaluate network performance by means of transport and flow control protocols, Congestion Control protocols and Quality of services. |
| CO5 | create a computer network application using modern network tools and simulation softwares. |

2. Syllabus

• **INTRODUCTION (06 Hours)**

Overview of Computer Networks and Data Communication, Computer Networking Protocols and Standards, Types of Computer Networks, Network Topology, Protocol Hierarchies and Design Issues, Interfaces and Services, Networking Devices, OSI and TCP/IP Reference Models.

• **PHYSICAL LAYER (06 Hours)**

Physical Layer Design Issues, Data Transmission Techniques, Multiplexing, Transmission Media, Asynchronous Communication, Wireless Transmission, ISDN, ATM, Cellular Radio, Switching Techniques and Issues.

• **LOGICAL LINK CONTROL LAYER (06 Hours)**

LLC Design Issues, Framing, Error and Flow Control, Framing Techniques, Error Control Methods, Flow Control Methods, PPP and HDLC.

• **MEDIUM ACCESS CONTROL LAYER (06 Hours)**

MAC Layer Design Issues, Channel Allocation Methods, Multiple Access Protocols - ALOHA, CSMA, CSMA/CD Protocols, Collision Free Protocols, Limited Contention Protocols, LAN Architectures, IEEE -802 Standards, Ethernet(CSMA/CD), Token Bus, Token Ring, DQDB, FDDI, Bridges and Recent Developments.

• **NETWORK LAYER** **(06 Hours)**

Network Layer Design Issues, Routing Algorithms and Protocols, Congestion Control Algorithms and QoS, Internetworking, Addressing, N/W Layer Protocols and Recent Developments.

• **TRANSPORT LAYER** **(06 Hours)**

Transport Layer Design Issues, Transport Services, Sockets, Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Transport Layer Protocols, Real Time Transport Protocol (RTP), Stream Control Transmission Protocol (SCTP), Congestion Control, QoS and Recent Developments, Virtualization, Network Functions Virtualization(NFV), Software Defined Networks.

• **APPLICATION LAYER** **(06 Hours)**

Client Server Model, Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP) and Recent Developments.

Tutorials will be based on the coverage of the above topics separately (14 Hours)

Practicals will be based on the coverage of the above topics separately (28 Hours)

(Total Contact Time: 42 Hours + 14 Hours + 28 Hours= 84 Hours)

3. Practicals:

- 1 Study network configuration commands and computer network setup.
- 2 Implementation of different Data Link and MAC Layer protocols.
- 3 Implementation of different Network Layer protocols.
- 4 Implementation of different Transport and Application Layer protocols.
- 5 Design and configure a network systems using modern network simulator softwares.
- 6 Implementation of Secured Socket Layer protocol.
- 7 Implementation of ICMP based message transmission over network.
- 8 Implementation of SMTP protocol for mail transfer.

4. Tutorials:

- 1 Problem solving on basics of data communication and networking.
- 2 Problem solving on framing, error control and flow control of Data link layer.
- 3 Problem solving on various LAN standards.
- 4 Problem solving on logical address, sub net masking and routing protocols of Network Layer.
- 5 Problem solving on congestion control, flow control and error control of transport layer.

- 6 Problem solving on various services provided by application layer.

5. Books Recommended:

1. William Stalling, "Data and Computer Communication", 10/E, Pearson India, 2017.
2. B. Forouzan, "Data Communication and Networking", 5/E, McGraw Hill, 2017.
3. Douglas E. Comer, "Internetworking with TCP/IP Volume – I", 6/E Pearson India, 2015.
4. Andrew S. Tanenbaum, "Computer Network", 5/E, Pearson India, 2013.
5. W. Richard Stevens, "TCP/IP Illustrated Volume - I", 2/E, Addison Wesley, 2011.

B.Tech. III (CSE) Semester – V

PROFESSIONAL ETHICS, ECONOMICS AND BUSINESS MANAGEMENT

HU303

Scheme

| L | T | P | Credit |
|---|---|---|--------|
| 4 | 0 | 0 | 04 |

1. Course Outcomes (COs):

At the end of the course, students will be able to

| | |
|-----|---|
| CO1 | identify application of ethics in society and development of understanding regarding Professional ethical issues related to Computer Science and Engineering. |
| CO2 | develop managerial skills to become future engineering managers. |
| CO3 | develop skills related to various functional areas of management (Marketing Management, Financial Management, Operations Management, Personnel Management etc.) |
| CO4 | build knowledge about modern management concepts (ERP, SCM, e-CRM, etc.) |
| CO5 | develop experiential learning through Management games, Case study discussion, Group discussion etc. |
| CO6 | apply knowledge of Economics and Business management aspects in Computer Science and Engineering. |

2. Syllabus

• **PROFESSIONAL ETHICS**

(14 Hours)

Introduction, Approaches to Ethics, Meaning of Ethics, Major attributes of Ethics, Business Ethics, Factors influencing Ethics, Importance of Ethics, Ethics in Management, Organizational Ethics, Ethical aspects in Marketing, Mass communication and Ethics - Television, Whistle blowing, Education – Ethics and New Professional, Intellectual Properties and Ethics, Introduction to Professional Ethics, Engineering Ethics, Ethical issues related to Computer Science and Engineering.

• **ECONOMICS**

(08 Hours)

Introduction to Economics, Micro & Macro Economics, Applications & Scopes Of Economics, Demand Analysis, Demand Forecasting, Factors Of Production, Types Of Cost, Market Structures, Break Even Analysis

• **MANAGEMENT**

(12 Hours)

Introduction to Management, Features Of Management, Nature Of Management, Development of Management Thoughts – Scientific Management By Taylor & Contribution of Henry Fayol, Coordination & Functions Of Management, Centralization & Decentralization, Decision Making; Fundamentals of Planning; Objectives & MBO; Types of Business Organizations: Private Sector, Public Sector & Joint Sector; Organizational Behaviour: Theories of Motivation, Individual &

Group Behaviour, Perception, Value, Attitude, Leadership.

• **FUNCTIONAL MANAGEMENT** **(18 Hours)**

Marketing Management: Core Concepts Of Marketing, Marketing Mix (4p), Segmentation – Targeting – Positioning, Marketing Research, Marketing Information System, Concept of International Marketing, Difference Between Domestic Marketing & International Marketing; Operations Management: Introduction to Operations Management, Types of Operation Systems, Types of Layouts, Material Handling, Purchasing & Store System, Inventory Management; Personnel Management: Roles & Functions of Personnel Manager, Recruitment, Selection, Training, Industrial Dispute, Collective Bargaining; Financial Management: Goal of Financial Management, Key Activities In Financial Management, Organization of Financial Management, Financial Institutions, Financial Instruments, Sources of Finance.

• **MODERN MANAGEMENT ASPECTS** **(04 Hours)**

Introduction To ERP, e – CRM, SCM, RE – Engineering, WTO, IPR Etc.

(Total Contact Time: 56 Hours)

3. Books Recommended:

1. Balachandran V. and Chandrasekaran, “Corporate Governance, Ethics and Social Responsibility”, PHI, 2nd Edition, 2011.
2. Prasad L.M., “Principles & Practice of Management, Sultan Chand & Sons”, 8th Edition, 2015.
3. Banga T. R. & Shrama S.C., “Industrial Organisation & Engineering Economics”, Khanna Publishers, 25th Edition, 2015.
4. Everett E. Adam, Ronald J. Ebert, “Production and Operations Management”, Prentice Hall of India, 5th edition, 2012.
5. Kotler P., Keller K. L, Koshi A. & Jha M., “Marketing Management – A South Asian Perspective”, Pearson, 14th Edition, 2014.

ADDITIONAL REFERENCE BOOKS

1. Tripathi P.C., “Personnel Management & Industrial Relations, Sultan Chand & sons”, 21st Edition, 2013.
2. Chandra P., “Financial Management”, Tata McGraw Hill, 9th Edition, 2015.
3. Crane A. & Matten D., “Business Ethics: Managing Corporate Citizenship and Sustainability in the Age of Globalisation”, Oxford University, 2010.
4. Fritzsche D. J., “Business Ethics: a Global and Managerial Perspectives”, McGraw Hill Irwin, Singapore, 2004.
5. Mandal S. K., “Ethics in Business and Corporate Governance”, Tata McGraw Hill, 2011.

B.Tech. III (CSE) Semester – V
MACHINE LEARNING (INSTITUTE ELECTIVE-1)
CS365

Scheme

| L | T | P | Credit |
|---|---|---|--------|
| 3 | 0 | 0 | 03 |

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|---|---|
| 1. <u>Course Outcomes (COs):</u> | |
| At the end of the course, students will be able to | |
| CO1 | acquire knowledge of pattern recognition, regression, classification, clustering algorithms and statistics. |
| CO2 | apply different classification, regression, machine learning algorithms and modelling. |
| CO3 | analyze the data patterns and modelling for applying the learning algorithms. |
| CO4 | evaluate the performance of an algorithm and comparison of different learning techniques. |
| CO5 | design solution for real life problems like biometric recognition, natural language processing and its related applications using various tools and techniques of machine learning. |

2. Syllabus

• **INTRODUCTION (09 Hours)**

Pattern Representation, Concept of Pattern Recognition and Classification, Feature Extraction, Feature Selection, Basics of Probability, Bayes Decision Theory, Maximum-Likelihood and Bayesian Parameter Estimation, Error Probabilities, Learning of Patterns, Modelling, Regression, Discriminant Functions, Linear Discriminant Functions, Decision Surface, Learning Theory, Fisher Discriminant Analysis.

• **SUPERVISED LEARNING ALGORITHMS (09 Hours)**

Linear Regression, Gradient Descent, Support Vector Machines, Artificial Neural Networks, Decision Trees, ML and MAP Estimates, K-Nearest Neighbor, Naive Bayes, Bayesian Networks, Classification, Overfitting, Regularization, Multilayer Networks, Back-propagation, Bayes Classification, Nearest Neighbor Classification, Cross Validation and Attribute Selection, K Means Clustering, Agglomerative Hierarchical Clustering.

• **UNSUPERVISED LEARNING ALGORITHMS (09 Hours)**

K-Means Clustering, Gaussian Mixture Models, Learning with Partially Observable Data, Expectation Maximization Approach. Dimensionality Reduction, Principal Component Analysis, Model Selection and Feature Selection.

• **TRANSFORM DOMAIN PATTERN ANALYSIS (06 Hours)**

Signal Transformation, Frequency Domain Representation of Signal, Feature Extraction and Analysis, Multiresolution Representation, Wavelet Transform, Discrete Cosine Transform.

• **APPLICATIONS** **(09 Hours)**

Signal Processing Application, Image Processing, Biometric Recognition, Face and Speech Recognition, Information Retrieval, Natural Language Processing.

(Total Contact Time: 42 Hours)

3. Books Recommended:

1. Geoff Dougherty, "Pattern Recognition and Classification: An Introduction", 1st Edition, Springer, 2013.
2. Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", 1st Edition, Springer, 2006.
4. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition, Wiley, 2001.
5. K. Fukunaga, "Introduction to Statistical Pattern Recognition", 2nd Edition, Academic Press, 2000.

ADDITIONAL REFERENCE BOOKS

1. Ranjjan Shinghal, "Pattern Recognition Techniques and Application", 1st Edition, Oxford university press, 2006.

B.Tech. III (CSE) Semester – V
DATA SCIENCE (CORE ELECTIVE-1)
CS321

Scheme

| L | T | P | Credit |
|---|---|---|--------|
| 3 | 0 | 0 | 03 |

1. Course Outcomes (COs):

At end of the Course student will be able to

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|-----|--|
| CO1 | understand types of data and various data science approaches. |
| CO2 | apply various data pre-processing and manipulation techniques including various distributed analysis paradigm using hadoop and other tools and perform advance statistical analysis to solve complex and large dataset problems. |
| CO3 | analyse different large data like text data, stream data, graph data. |
| CO4 | interpret and evaluate various large datasets by applying Data Mining techniques like clustering, filtering, factorization. |
| CO5 | design the solution for the real life applications. |

2. Syllabus

- INTRODUCTION (02 HOURS)**
Examples, Applications and Results Obtained Using Data Science Techniques, Overview of the Data Science Process.
- MANAGING LARGESCALE DATA (02 HOURS)**
Types of Data and Data Representations, Acquire Data (E.G., Crawling), Process and Parse Data, Data Manipulation, Data Wrangling and Data Cleaning.
- PARADIGMS FOR DATA MANIPULATION, LARGE SCALE DATA SET (08 HOURS)**
Mapreduce (Hadoop), Query Large Data Sets in Near Real Time with Pig and Hive, Moving from Traditional Warehouses to Map Reduce, Distributed Databases, Distributed Hash Tables.
- TEXT ANALYSIS (10 HOURS)**
Data Flattening, Filtering and Chunking, Feature Scaling, Dimensionality Reduction, Nonlinear Factorization, Shingling of Documents, Locality Sensitive Hashing for Documents, Distance Measures, LSH Families for Other Distance Measures, Collaborative Filtering.
- MINING DATA STREAM (08 HOURS)**
Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Moments, Windows, Clustering for Streams.

• **ADVANCE DATA ANALYSIS (12 HOURS)**

Graph Visualization, Data Summaries, Hypothesis Testing, ML Model-Checking and Comparison, Link Analysis, Mining of Graph, Frequent Item Sets Analysis, High Dimensional Clustering, Hierarchical Clustering, Recommendation Systems.

Total Contact Time: 42 Hours

3. Books Recommended:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'reilly Media, 2015, ISBN: 9781491901687.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", 2nd Edition, Cambridge University Press, 2014, ISBN: 9781107077232.
3. Peter Bruce, Andrew Bruce, "Practical Statistics for Data Scientists: 50" by , 1st Edition, O'reilly publishing house, 2017, ISBN: 9781491952962.
4. Joel Grus, J. "Data science from scratch", 1st Edition, O'Reilly Media, 2015, ISBN: 9781491901410.
5. Montgomery, Douglas C., and George C. Runger. "Applied statistics and probability for engineers", John Wiley & Sons, 7th Edition, 2018, ISBN: 9781119400363.