

SEMESTER – III

HCT3.1 Computer Networks

Total Hours: 48

UNIT-I:

10hrs

Foundation- Building a Network, Application, Requirement, Architecture, Software, Performance.
Direct Links- Connecting To A Network, Technology Landscape, Encoding, Error Detection. Reliable Transmission, Multi- Access Networks.

Unit-II

10hrs

Internetworking: Switching Basics, Switched Ethernet, Spanning Tree Algorithms. Broadcast and Multicast, Virtual LANs (VLANs), What Is An Internetworking? Service Model, Global Addresses, Datagram Forwarding In IP Sub-netting and Classless Addressing. Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP). Virtual Networks and Tunnels, Routing- Network As A Graph, Distance- Vector (Rip), Link State (OSPF), Metrics.

Unit-III

10hrs

Global Internet- Routing Areas, Inter-domain Routing (BGP). **IP Version 6-** Historical Perspective, Addresses and Routing, Packet Format, Advanced Capabilities. **Multicast -** Multicast Addresses, Multicast Routing (DVMRP, PIM, MSDP). **Multiprotocol Label Switching -** Destination-Based Forwarding, Explicit Routing, Virtual Private Networks and Tunnels.

Unit-IV

10hrs

Simple De-multiplexor (UDP), Reliable Byte Stream (TCP) - End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission

Remote Procedure Call - RPC Fundamentals. **Transport for Real-Time (RTP) -** Requirements, RTP Design, Control Protocol. **Congestion Control -** TCP Congestion Control.

Unit-V

08hr

Applications-Traditional Applications- Electronic Mail (SMTP, MIME, IMAP), World Wide Web (HTTP), Web Services. **Multimedia Applications-** Session Control and Call Control (SDP, SIP, H.323). Resource Allocation for Multimedia Applications

Reference Books:

1. Larry Peterson, "Computer Networks- A System Approach". 5th Edition. Elsevier
2. Kurose and Rose. "Computer Networking-A Top down Approach". 6th Edition. Pearson.2013
3. Andrew Tanenbaum, "Computer Networks". Prentice Hall
4. Behrouz Forouzan, "Data Communications and Networking". 4th Edition. Megraaw Hill. 2017



HCT 3.2: SOFTWARE ENGINEERING

Total Hours: 48

Unit: I

10hrs

The Product and The Process: Evolving Role Of Software, Software, Characteristics and Components, Crises, Software Myths, Software Engineering A Layered Technology, Software Process, Linear Sequential Model, Prototyping Model, Prototyping Model, Rad Model, Evolutionary Software Process Model. **Project Management Concepts:** The Management Spectrum, the People, the Product, the Process, and the Project W5hh Principle. **Software Process and Project Metrics:** Measures, Metric Indicators, Metric in Process and the Project Domains, Software Measurement, Metrics for Software Quality.

Unit-II

10hrs

Software Project Planning: Project Planning Objectives, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models. **Risk Analysis and Management:** Software Risks, Risk Identification, Risk Projection, Risk Refinement and Risk Mitigation, Monitoring, and Management

Unit-III

10hrs

Analysis Concepts and Principles: Requirement Analysis, Communication Techniques, Analysis Principles, Software Prototyping and Specification. **Analysis Modeling:** Elements of Analysis Model, Data Modeling, Functional Modeling, Behavioral Modeling, The Mechanics of Structured Analysis, Data Dictionary, Other Classical Analysis Methods.

Unit-IV

10hrs

Design Concepts and Principles: Software Design and Software Engineering Design Process Design Principles, Design Concepts, Design Methods, Data Design, Architectural Design and Process, Transform and Transaction Mappings, Design Post Processing, Architectural Design Optimization, Interface Design, Procedural Design.

Unit-V

10hrs

Software Testing Techniques and Strategies: Fundamentals, Test Case Design, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing, Software Testing Strategies. **Software Configuration Management:** Configuration Management, Maintenance Costs, Maintenance Side Effects, Maintenance Tissues.

Software Quality Assurance: Quality Concepts, Software Quality Assurance, FTR, ISO 9001, Iso-9002, Iso-9003, Introduction to Case, DOD Standard 2167 A.

References:

1. Software Engineering, Fifth Edition, Roger- Pressman, Mcgraw Hill.
2. Software Engineering, Ian Sommerville, International Computer Science, Series
3. Software Engineering, Schooma, Mcgraw Hill
4. Object Oriented Design and Analysis, Booch, Benjamin/ Cummings,
5. Software Engineering, A Practitioner's Approach 7th Edition, Roger- Pressman, Tata Mcgraw-Hill Education (2010)



HCT 3.3: Web Technologies

Total Hours: 48

Unit-1:

10 Hrs

Web Essentials - W3c - Clients - Servers - Communication - Markup Languages - XHTML- Simple XHTML Pages Style Sheets – CSS.

Unit-II:

12 Hrs

Client Side Programming: Introduction to Java Script, Basic Syntax, Variables and Data Types. Statements, Operators, Literals, Functions, Objects, Arrays, Built-In Objects, Java Script Debuggers. **Host Objects Browsers and the Dom:** Introduction to Document Object Model, Dom History and Levels, Intrinsic Event Handling, Modifying Element Style, The Document Tree, Dom Event Handling.

Unit-III:

12 Hrs

Server Side Programming: (Java Servlets) - Servlet Architecture Overview, A "Hello World!" Servlet, Servlet Generating Dynamic Content, Servlet Lifecycle, Parameter Data, Sessions. Cookies, URL Rewriting, Other Servlet Capabilities, Data Storage, Servlets and Concurrency. Separating Programming and Presentation (JSP Technology): Introduction to Java Server Pages, JSP and Servlets, Running JSP Applications, Basic JSP, Java Beans Classes and JSP. Tag Libraries And Files, Support For The Model - View Controller Paradigm.

Unit-IV:

07 Hrs

Representing Web Data: XML, XML Document and Vocabularies, XML Declaration, XML Namespaces, Java Script and XML: Ajax, Dom Based XML Processing, Event-Oriented Parsing: Sax, Transforming XML Documents, Selecting XML Data: XPATH Template-Based Transformation: XSLT, Displaying XML Documents In Browsers.

Unit-V:

07 Hrs

Web Services: JAX-RPC, WSDL, XML Schema and Soap: Web Service Concepts. Writing a Java Web Service, Writing a Java Web Service Client, Describing Web Services: WSDL. Representing Data Types: XML Schema, Communicating Object Data: Soap. Databases and Java Servlets, Databases and JSP

References

1. Jeffrey C Jackson, "Web Technology - A Computer Science Perspective". Person Education, 2007.
2. Chris Bates, "Web Programming - Building Internet Applications, "Wiley India, 2006

HCT 3.4(a): Mobile Computing

Total 48hrs

Unit-I

10hrs

Mobile Computing Architecture: An Overview, Mobile IP, Cellular and WLAN Wi-Fi IEEE 802.11X Networks, Ad Hoc Networks, Wireless Personal Area Network, Mobile Enterprise Network, Mobile Cloud Network, Mobile Computing, Mobile Computing Operating System, Mobile Computing Architecture, Design Considerations for Mobile Computing, Mobile Computing and the Apps, Limitations of Mobile Devices, Security Issues

Unit-II

10hrs

Mobile Client Devices and Pervasive Computing: Moving beyond Desktops, Pervasive Computing, Mobile Devices-Classifications and Characteristics, Tablet and e-Book Reader, Smart Identification Devices: Smart Cards, Labels, and Tokens, RFID, Smart Sensors, Actuators, and Mobile Robotic Systems, Smart Home and Appliances, Limitations and Devices Design Constraints, Automotive Systems

Unit-III

10hrs

Second-generation Architecture—GSM, GPRS, and Others: GSM Services, GSM System Architecture, Call Routing, Public Land Mobile Network (PLMN) Interface, GSM Subscriber Addresses and Identities, Protocols, Localization, Call Handling, Handover, Security, Introduction to SMS, General Packet Radio Service, High-speed Circuit-switched Data

Unit-IV

10hrs

Wireless Medium Access Control, CDMA, 3G, WiMax, 4G and 5G Networks: Modulation, Medium Access Control, Exposed and Hidden Terminal Problem, Near and Far Terminal Problem, and Power Control for Medium Access, MAC Algorithms, WLAN and CAMA/CA Wireless Protocols, Applications of 3G Mobile Services, 3G Mobile Services: IMT2000 and UMTs, CDMA 2000: 3G, WCDMA 3G, OFDM, High-speed Packet Access, Long-term Evolution and WiMax 16E, 4G Networks: HS-OFDM, LTE Advanced and WiMax 16M, Upcoming 5G Network Features.

Unit-V

08hrs

Mobile IP Network Layer: Mobile IP, Packet Delivery and Handover Management, Location Management, Registration, IP Header: Encapsulation and Routes Optimization, Mobility Binding, Tunneling, and Reverse Tunneling, Dynamic Host Configuration Protocol, Cellular IP, Mobile IP with IPv6, Voice over IP, IP Security.

Reference Books:

1. Raj Kamal, "Mobile Computing", 3rd edition, oxford University press.
2. Pattnaik, "Fundamentals of mobile computing", 2nd edition, PHI
3. Uwe Hansmann, "Principles of mobile computing", 2nd edition, Springer international, 2014

HCT 3.4(b): Digital Image Processing

Total 48hrs

Unit-I

10hrs

Digital Image Processing: Origins of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of An Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, Light and The Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationship Between Pixels, Mathematical Tools Used In Digital Image Processing.

Unit-II

10hrs

Image Transformation and Spatial Filters: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods, Fuzzy Techniques For Intensity Transformation And Spatial Filtering. Filtering In The Frequency Domain: Preliminary Concepts, Sampling And The Fourier Transforms of Sampled Functions, The Discrete Fourier Transform (DFT), Properties of The 2-D DFT, Filtering In The Frequency Domain, Image Smoothing and Sharpening Using Frequency Domain Filters, Selective Filtering.

Unit-III

10hrs

Image Restoration and Reconstruction: A Model of The Image Degradation Restoration Process, Noise Models, Restoration In The Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction By Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating The Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Square Filtering, Geometric Mean Filter, Image Reconstruction From Projections. Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation.

Unit-IV

10hrs

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing, Full Color Image Processing, Color Transformation, Smoothing and Sharpening, Image Segmentation Based on Color, Noise in Color Images. Wavelets and Multi resolution Processing: Background, Multi resolution Expansion, Wavelet Transforms In One Dimension, The Fast Wavelet Transform, Wavelet Transforms In Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Basic Compression Methods, Digital Image Watermarking.

Unit-V

08hrs

Morphological Image Processing: Erosion and Dilation, Opening and Closing, The Hit-Or- Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology. Object Recognition: Patterns and Pattern Classes, Recognition Based On Decision-Theoretic Methods, Structural Methods.

Text Book:

Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson Education, 2008.

Unit I: Chapter 1 And 2

Unit II: Chapter 3 And 4

Unit III Chapter 5 And 10

Unit IV: Chapter 6,7 And 8

Unit V: Chapter 9 And 12

Reference Books:

1. Digital Image Processing Using MATLAB, Rafael C. Gonzalez, Richard E. Woods, 2nd Edition, Prentice Hall of India, 2002.
2. Fundamentals of Digital Image Processing, A.Jain, Prentice Hall of India, 2010.
3. Digital Image Processing, Willlliam K Pratt, John Willey, 2002.

HCT 3.4(c): Soft Computing

Total 48hrs

Unit-I

10hrs

Introduction to Soft Computing- Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy Systems, Genetic Algorithm and Evolutionary Programming, Swarm Intelligent Systems, Expert Systems.

Unit- II

10hrs

Artificial Neural Networks- First Generation- Introduction to Neural Networks, Biological Inspiration, Biological Neural Networks to Artificial Neural Networks, Classification of ANNs, First- Generation Neural Networks.

Unit- III

10hrs

Fuzzy Logic- Introduction To Fuzzy Logic, Human Learning Ability, Imprecision, and Uncertainty, Un-decidability, Probability Theory Vs. Possibility Theory, Classical Sets and Fuzzy Sets Operations, Fuzzy Relations Fuzzy Composition. **Fuzzy Logic Application:** Introduction to Fuzzy Logic Applications, Fuzzy Controllers.

Unit-IV

10hrs

Genetic Algorithms and Evolutionary Programming - Introduction to Genetic Algorithms, Genetic Algorithms, Procedures of GAS, Working of Gas, Genetic Algorithm Applications.

Unit-V

08hrs

Introduction to Swarm Intelligence - Background of Swarm Intelligent Systems, Ant Colony System, Working of Ant Colony Optimisation, Ant Colony Optimisation Algorithm For TSP.

Text Book:

Soft Computing With Pprogramming, N.P.Padhy, S.P.Simon, Oxford University Press, First Edition, 2015

UNIT 1: Chapter 1 -1.1 To 1.7 (Except 1.8)

UNIT 2: Chapter 2-2.1 To 2.5 (Except 2.6 To 2.8).

UNIT 3: Chapter 5-5.1 To 5.8, Chapter 6 (6.1, 6.2)

UNIT 4: Chapter 7-7.1 To 7.5.

UNIT 5: Chapter 8-8.1 To 8.5.

REFERENCES:

1. Principles Of Soft Computing, S.N.Sivanandam And S.N.Deepa, Wiley India Edition, 2nd Edition, 2013.
2. Neural Networks, Simon Haykin, Pearson Education, 2003.
3. Fuzzy Logic-Intelligence Control & Information, John Yen & Reza Langari, Pearson Education, New Delhi, 2003
4. Artificial Intelligence And Intelligent Systems, N.P.Padhy, Oxford University Press, 2013.

HCT 3.4(d): Data Mining and Warehousing

Total 48hrs

Unit-I

10hrs

Introduction - Why Data Mining? - What is Data Mining? - What Kinds of Data Can Be Mined? - What Kinds of Patterns Can Be Mined? - Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Getting to Know You're Data: Data Objects and Attribute Types - Basic Statistical Descriptions of Data - Data Visualization - Measuring Data Similarity and Dissimilarity.

Unit-II

10hrs

Data Preprocessing: Data Preprocessing An Overview - Data Cleaning - Data Integration Data Reduction - Data Transformation and Data Discretization - Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts Data Warehouse Modeling: Data Cube and OLAP - Data Warehouse Design and Usage Data Warehouse Implementation Data Generalization by Attribute-Oriented Induction.

Unit-III

10hrs

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods Frequent Item set Mining Methods Which Pattern Are Interesting? Pattern Evaluation Methods. Advanced Pattern Mining: Pattern Mining: A Road Map - Pattern Mining in Multilevel, Multidimensional Space- Constraint-Based Frequent Pattern Mining - Mining High- Dimensional Data and Colossal Patterns - Mining Compressed or Approximate Patterns - Pattern Exploration and Application.

Unit-IV

10hrs

Classification: Basic Concepts - Basic Concepts - Decision Tree Induction - Bayes Classification Methods Rule-Based Classification- Model Evaluation and Selection-Techniques to Improve Classification Accuracy.

Unit-V

10hrs

Cluster Analysis Basic Concepts and Methods: Cluster Analysis - Partitioning Methods - Hierarchical Methods - Density Based Methods - Grid Based Methods -Evaluation of Clustering.

Text Book:

Data Mining Concepts and Techniques - Third Edition, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufmann Publisher, 2012.

Unit 1 Chapters 1 and 2

Unit II Unit III Chapters 3 and 4 Chapters 6 and 7

Unit IV Chapter 8

Unit V Chapter 10

Reference Books:

1. Insight into Data mining Theory and Practice, K.P. Soman, ShyamDiwakar and V. Ajay, Easter Economy Edition, Prentice Hall of India, 2006.

2. Introduction to Data Mining with Case Studies, G. K. Gupta, Easter Economy Edition, Prentice Hall of India, 2006.

3. Introduction to Data Mining Pang-Ning Tan, Michael Steinbach and Vipin Kumar,, Pearson Education, 2007.

4. Modern Data Warehousing, Mining and Visualization, Marakas, George M, Pearson Education, 2011.

Unit-I**15hrs****Association Rule mining -**

- The applications of Association Rule Mining: Market Basket, Recommendation Engines, etc.
- A mathematical model for association analysis; Large item sets; Association Rules
- Apriori: Construct large item sets with mini sup by iterations; Interestingness of discovered association rules;

Supervised Learning – Regression : Regression in supervised learning is the technique of understanding the relationship between a dependent and an independent variable. It is used to predict continuous outcomes in predictive modelling.

- Introduction to Regression: Definition, types, and use cases
- Linear Regression: Theory, cost function, gradient descent, and assumptions
- Polynomial Regression: Adding polynomial terms, degree selection, and overfitting
- Lasso and Ridge Regression: Regularization techniques for controlling model complexity
- Evaluation metrics for regression models: Mean Square Error (MSE), R-Squared, and Mean Absolute Error (MAE)

Classification

Another application of supervised learning is classification, where the machine learning model tries to predict the right label for a given input data. This section introduces you to Classification, its types and use cases, along with knowledge of logistic regression, decision trees and random forests. You will also learn about the evaluation metrics for classification models

- Logistic Regression: Theory, logistic Function, binary and multiclass classification
- Decision Trees: Construction, splitting criteria, pruning, and visualization
- Random Forests: Ensemble learning, bagging, and feature importance
- Evaluation metrics for classification models: Accuracy, Precision, Recall, F1-score, and ROC curves

Unit-II**15hrs**

SVM, KNN & Naive Bayes - SVM, KNN and Naive Bayes are the three popular supervised learning algorithms. You will learn them all from this segment in detail.

- Support Vector Machine (SVM): Study SVM theory, different kernel functions (linear, polynomial, radial basis function), and the margin concept. Implement SVM classification and regression and evaluate the models.
- K-Nearest Neighbors (KNN): Understand the KNN algorithm, distance metrics, and the concept of K in KNN. Implement KNN classification and regression and evaluate the models.
- Naive Bayes: Learn about the Naive Bayes algorithm, conditional probability, and Bayes theorem. Implement Naive Bayes classification and evaluate the model's performance

Ensemble Methods and Boosting

- AdaBoost: Boosting technique, weak learners, and iterative weight adjustment
- Gradient Boosting (XGBoost): Gradient boosting algorithm, Regularization, and hyperparameter tuning
- Evaluation and fine-tuning of ensemble model: Cross-validation, grid search, and model selection
- Handling imbalanced datasets: Techniques for dealing with class imbalance, such as oversampling and under sampling

Unit-III

10hrs

Unsupervised Learning - Clustering

- Introduction to Clustering: Definition, types, and use cases
- K-means Clustering: Algorithm steps, initialization methods, and elbow method for determining the number of clusters
- DBSCAN (Density-Based Spatial Clustering of Applications with Noise): Core points, density reachability, and epsilon-neighborhoods
- Evaluation of clustering algorithms: Silhouette score, cohesion, and separation metrics

Dimensionality Reduction

- Introduction to Dimensionality Reduction: Curse of dimensionality, feature extraction, and feature selection.
- Principal Component analysis (PCA): Eigenvectors, eigenvalues, variance explained, and dimensionality reduction

Unit-IV

8hrs

Reinforcement Learning –

- Introduction to Reinforcement Learning: Agent, environment, state, action, and reward
- Markov Decision Processes (MDP): Markov property, transition probabilities, and value functions
- Q-Learning algorithm: Exploration vs. exploitation, Q-table, and learning rate

Text Books

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020)
2. Tom M. Mitchell-Machine Learning-McGraw Hill Education, International Edition
3. Aurelien Geron Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow, O'Reilly Media, Inc. 2nd Edition

Reference Books

1. Ian Goodfellow, Yoshoua Bengio, and Aaron Courville Deep learning MIT Press Ltd, Illustrated edition
2. Christopher M. Bishop Pattern Recognition and Machine Learning - Springer, 2nd edition
3. Trevor Hastie, Robert Tibshirani, and Jerome Friedman - The Elements of Statistical Learning: Data Mining, Inference and Prediction-Springer, 2nd edition

OET 3.1: SPSS TOOL

Total Hours: 32

Unit-I

16 Hrs.

Table of contents: Overview of PASW statistics, Introduction to PASW: Menus, Tool Bar, Dialogue Box, Designate Window, Basic steps for performing any statistical Procedure.

Data Management: Creating a Data File, Defining Variables, Entering the Data, Saving Data, Opening an existing Data file, Inserting Variables, Inserting Cases, Identifying Duplicate Cases, Identifying Unusual Cases, Sorting Cases, Merging a File : Add Cases, For Adding Variables, Data Aggregation , Splitting File, Selecting Cases, Listing Cases.

Unit-II

16 Hrs.

Data Transformation: Computing a New Variable, Recoding Variables, Automatic Recode, Visual Binning, Rank Cases.

Describing Data Numerically: Types of Measurement Scales, Summary Measures, Frequencies, Descriptive Statistics, Explore, Crosstabs.

References:-

- 1) SPSS in simple steps by Kiran Pandya Smruti Bulsari Sanjay Sinha,Dream Tech Press(2011)
- 2) Applied Statistics With SPSS by Eelko Huizingh, New Edition ,Sage Publications(CA) (2007)
- 3) SPSS: A User Friendly approach by Jeffrey E.Aspelmeier,Thomas W.Pierce Worth Publishers(2009)
- 4) Statistical Methods for Practice and Research: A Guide to Data Analysis using SPSS 0002 Edition, Response Books(2009)