CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Kokapet (Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in

ISO Certified 9001:2015

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 43 years

Scheme of Instruction and Syllabi

of

V - VI SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING
(IOT & CYBER SECURITY INCLUDING BLOCKCHAIN TECHNOLOGY)
(AICTE Model Curriculum with effect from AY 2022-23)

R-20 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad – 500075. Telangana
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum(R-20) 2022-23

B.E. (CSE - IOT & Cyber Security including Blockchain Technology)

SEMESTER –V

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20CSC12	Design and Analysis of Algorithms	3	-	-	3	40	60	3
2	20CSC20	Operating Systems	3	-	-	3	40	60	3
3	20CIC03	IoT Development, Applications and Practice	3	-	-	3	40	60	3
4	20CIC04	Computer Networks	3	-	-	3	40	60	3
5		Professional Elective - I	3	-	-	3	40	60	3
6		Open Elective – I	3	-	-	3	40	60	3
PRACTICAL									
7	20CSC23	Operating Systems Lab	-	-	3	3	50	50	1.5
8	20CIC05	IoT Development, Applications and Practice Lab	-	-	3	3	50	50	1.5
9	20CIC06	Computer Networks Lab	-	-	3	3	50	50	1.5
10	20CII02	Internship-II (Industrial/ Rural Internship)	3-4 weeks/ 90 hours			-	50	-	2
TOTAL			**18**	**-**	**9**	-	**440**	**510**	**24.5**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

PROFESSIONAL ELECTIVE-I	
20CIE01	Linux Kernel Internals and Programming
20CIE02	Image Processing
20CIE03	Artificial Intelligence and Machine Learning
20CSE05	Optimization Techniques
20CSE12	Embedded Systems

OPEN ELECTIVE – I	
20ECO10	Fundamentals of Wireless Communication
20EEO05	Waste Management
20MEO09	Organizational Behaviour
20MTO03	Quantum Computing
20BTO04	Bioinformatics

20CSC12

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are to

1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

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

1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Understand P, NP, NP-Hard, NP-Completeness and Reducibility.

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring and Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.

2. E. Horowitz, sartajsahni and sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis”, and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

20CSC20

OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisites: Computer Architecture and Programming Fundamentals.

Course Objectives: The objectives of this course are,

1. Should be able to describe the operating system service, and the design of an operating system.
2. To understand the structure and organization of the file system, process synchronization, process scheduling, system calls and different approaches to memory management.
3. To understand about the cloud infrastructures and technologies.

Course Outcomes: On successful completion of the course, students will be able to,

1. Identify the basics of an operating systems and its major components.
2. Understand the concepts related to process synchronization and deadlocks.
3. Distinguish various memory management techniques.
4. Interpret various threats and defense mechanisms used to protect the system.
5. Evaluate various file allocation methods.
6. Apply security as well as recovery features in the design of algorithms.

UNIT - I

Concepts of Operating Systems: Computer System over view, concept of an operating system, Types of operating systems, general system architecture, system components, operating system services, system calls, system programs, approaches to OS design and implementation: Micro-kernel, Layered, Kernel Approach.

UNIT - II

Processes and Threads: Concept of process, process states, process state transitions, process control block, operations on processes, concurrent processes, mutual exclusion and synchronization, principles of deadlocks, integrated deadlocks strategy, scheduling levels, scheduling criteria, algorithms, Inter Process Synchronization, Inter Process Communication, Linux IPC Mechanisms, RPC, RPC exception handling, Security issues.

UNIT - III

Memory Management and Data Management: Logical and physical address space, storage allocation and management techniques, swapping concept of multi-programming, paging, segmentation, virtual storage management strategies, demand paging, page replacement algorithms, thrashing, File organization, record blocking, access methods, directory structure, protection file system structure, allocation methods, free space management, directory implementation, disk structure, disk scheduling, disk management, buffering, swap space management, RAID levels.

UNIT - IV

OS Security: Types of threats in OS, basic security mechanisms, understanding the threats, malware taxonomy, viruses, worms, rootkits; Defense: overview, logging, auditing, and recovery, OS-level memory protection.

UNIT - V

Case studies and OS Abstractions: Linux/Unix OS design and architecture, Unix shell, Unix OS services, user perspective, representation of files in Unix, system processes and their structure, I/O system, memory management in Unix. Processes management, file management, IPC and network related system calls.

Text Books:

1. Galvin, Silberschatz, “Operating system Concepts”, 10th Edition, John Wiley & Sons, 2018.
2. Dhananjay Dhamdhare, “Operating Systems-A Concept Based Approach”, 3rd Edition, McGraw Hill Education, 2017.

Suggested Reading:

1. Ekta Walia, “Operating System Concepts”, Khanna Book Publishing, 2020.
2. William Stallings, “Operating Systems Internals and Design Principles”, Pearson Edition, 2012.
3. Charles Crowley, “Operating Systems –A Design Oriented Approach”, McGraw Hill Education, 2017.
4. Andrew S. Tanenbaum, Albert S Woodhull, “Operating systems Design and Implementation”, Pearson Edition, 2009.

20CIC03

IOT DEVELOPMENT, APPLICATIONS AND PRACTICE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Computer Architecture and Micro Processor, Programming for Problem Solving.

Course Objectives: The objectives of this course are to

1. Understand the basics of IoT.
2. Impart necessary and practical knowledge in Internet of Things.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand Internet of Things, its hardware and software components.
2. Illustrate working of I/O devices, sensors & communication module.
3. Compare communication protocols in IoT.
4. Explore fundamentals of IoT Data Analytics and Supporting Services.
5. Organize and Analyze IoT data.
6. Develop real time IoT based projects.

UNIT – I

Introduction to IoT: IoT-An Architectural Overview – Building an architecture, Main design principles and needed capabilities.

IoT Architecture:-State of the Art – Introduction, State of the art, Reference Model and architecture.

UNIT – II

Elements of IoT: Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues, Computing (Arduino, Raspberry Pi), Communication modules, I/O interfaces, Programming API's.

UNIT – III

IoT data protocols: MQTT, CoAP, AMQP, DDS, HTTP, WebSocket.

Network Protocols for IoT: 6LowPAN, RPL, IPV6, WiFi, Bluetooth, ZigBee, Z-Wave, LoRaWan, MQTT, XMPP.

UNIT – IV.

Data Analytics: Introduction, Structured versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquisition and Organization in IoT.

Supporting Services: Computing using a Cloud Platform for IoT Applications/Services, Everything as a service and Cloud Service Models.

UNIT – V

IoT Case Studies: IoT case studies based on Industrial automation, Transportation, Agriculture, Healthcare and Home Automation.

Text Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1stEdition, Academic Press, 2014
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

4. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media, 2011.

Online Resources:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey”, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”, Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”, Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.
7. https://onlinecourses.nptel.ac.in/noc19_cs31/
8. https://www.nabto.com/guide-iot-protocols-standards/

20CIC04

COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Programming for Problem Solving, Data Structures.

Course Objectives: The objectives of this course are to

1. Understand the principles of data communication and organization of computer networks.
2. Analyze various routing protocols and congestion control algorithms.
3. Study the functions of transport layer and various application layer protocols.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate Data Communications System and its components.
3. Analyze various routing protocol, congestion control algorithms.
4. Distinguish the internet protocols like IP, ICMP, IGMP, BGP, OSPF, and DHCP.
5. Understand the transport layer protocols like TCP, UDP and SCTP.
6. Identify the functions of application layer protocols like HTTP, WWW, DNS, Email protocols and SFTP.

UNIT - I

Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmissionmedia (wired and wireless), switching.

UNIT - II

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, multiple access protocols, HDLC, Point to Point Protocol.
LAN: Wired LAN, wireless LAN -802.11, 802.15 and Virtual LAN.

UNIT - III

Network Layer: Network layer design issues, routing algorithms, IPV4, IPV6, Internet, network layer protocols -ICMP, IGMP and DHCP.

UNIT - IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, RTC, RTCP, Congestion control techniques, quality of service.

UNIT - V

Application Layer: Domain Name Space (DNS), EMAIL, SNMP, SSH, SFTP, WWW, HTTP, Firewalls.

Text Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, 5th Edition, 2017.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

20CIE01

LINUX KERNEL INTERNALS AND PROGRAMMING
(Professional Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Programming for Problem Solving.

Course Objectives: The objectives of this course are to

1. Acquaint with Linux kernel internals, system commands and tools.
2. Understand Linux systems programming in-depth.
3. Learn various standards and libraries in the Linux community.
4. Use of various applications on Linux platform.
5. Implement different system calls in the Linux platform.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand fundamental concepts of Linux kernel.
2. Apply system programming concepts and its library functions.
3. Analyze memory management and system administration.
4. Create multithreaded programs using POSIX threads.
5. Work with file management and system management.

UNIT - I

Fundamental Concepts. The Kernel. The Shell. Users and Groups. Directory Hierarchy, Links and Files. File I/O Model. Programs. Processes. Memory Mappings. Static and Shared Libraries. Inter-process Communication and Synchronization. Signals. Threads. Process Groups and Shell Job Control. Sessions, Controlling Terminals, and Controlling Processes. Pseudo-terminals. Date and Time. Client-Server Architecture. Real-time. The /proc File System.

UNIT - II

System Programming Concepts. System Calls. Library Functions. The Standard C Library -GNU C library (glibc). Handling Errors from System Calls and Library Functions. Example Programs. Processes and Programs. Process Creation. Overview of fork(), exit(), wait() and execve(). Using fork(), vfork() and clone(). Race conditions after fork(). Avoiding Race conditions. Process Termination: _exit() and exit(). Exit Handlers. Interaction between fork(), stdio Buffers and _exit(). Monitoring Child Processes. Waiting on Child: wait(), waitid(), wait3() and wait4(), system calls. Orphans and Zombies.

UNIT - III

Memory Layout of a Process. Virtual Memory Management. The Stack and Stack Frames. Environment List. Memory Allocation. Allocating Memory on the Heap. Allocating Memory on the Stack. Process Credentials. Real User ID and Real Group ID. Effective User ID and Effective Group ID. Set-User-ID and Set-Group-ID Programs. File-System User ID and File-System Group ID. The /proc File System.

UNIT - IV

Signals Fundamentals. Signal Types and Default Actions. Introduction to Signal Handlers. Designing Signal Handlers. SIGCHLD Signal. Handler for SIGCHLD. Threads Introductions. Pthreads API. Creation and Termination. Joining and Detaching. Thread Synchronization. Mutexes and Condition Variables. Thread Safety. Thread Stacks. Threads and Signals. Threads and Process Control. Thread Implementation Models.

UNIT - V

The Universal I/O Model. Overview. Universality of I/O. Opening, Reading, Writing and Closing files. Operations outside the universal I/O Model: ioctl(). Atomicity and Race Conditions. File Control Operations: fnctl(). Relationship between File Descriptors and Open Files. Duplicating File Descriptors. File I/O at Specified Offset. Scatter-Gather I/O: readv() and writev(). Truncating a File: truncate() and ftruncate(). Nonblocking I/O. I/O on Large Files. The /dev/fd Directory. Creating Temporary Files. Fundamentals of Shared Libraries. Object Libraries. Static Libraries. Overview. Creating and Using Shared Libraries. Working with Shared Libraries.

Installing Shared Libraries. Upgrading Shared Libraries. Dynamically Loaded Libraries. Preloading Shared Libraries.

Text Books:

1. Michael Kerrisk, "The Linux Programming Interface: a Linux and UNIX system programming handbook", Publisher: No Starch Press, 2010 ISBN-13: 978-1-59327-220-3.
2. Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel", 3rd Edition Publisher: O'Reilly Pub Date: November 2005 ISBN: 0-596-00565-2 Pages: 942.

Online Resources:

1. https://docs.kernel.org/
2. https://man7.org/tlpi

20CIE02

IMAGE PROCESSING
(Professional Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Problem Solving, Linear Algebra, Calculus.

Course Objectives: The objectives of this course are to

1. Introduce the concepts of image processing and basic analytical methods to be used in image processing.
2. Comprehend the relation between human visual system, machine perception and processing of digital images.
3. Provide a detailed approach towards image processing like enhancement techniques.
4. Familiarize with image enhancement and restoration techniques.
5. Explain different image compression and morphological processing techniques.

Course Outcomes: On successful completion of the course, students will be able to

1. Explain the basic principles of image processing and its significance in real world.
2. Interpret various types of images and applies image transformations.
3. Evaluate various approaches for image segmentation and image restoration.
4. Define image processing methods and recognize morphological image processing techniques.
5. Recognize image compression and comprehend image compression techniques in both domains.
6. Apply image processing algorithms for real world problems.

UNIT – I

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. **Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT – II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. **Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT – III

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration. **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT – IV

Morphological Image Processing: Basics, Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation. Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT – V

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson 4th Edition, 2018.
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, McGraw Hill Education, 2010.

Suggested Reading:

1. Scotte Umbaugh, “Digital Image Processing and Analysis: Human and Computer Vision Application with using CVIP Tools”, CRC Press, 2nd Ed, 2011.
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, McGraw Hill Education, 2nd Edition, 2010.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning (Indian edition) 2008.
4. Adrian Andrew Low, “Introductory Computer Vision Imaging Techniques and Solutions”, BS Pub, Second Edition, 2008.

20CIE03

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Professional Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra and Calculus, Object Oriented Programming, Data Structures.

Course Objectives: The objectives of this course are to

1. Provide basics skills for design and analyze AI Algorithms.
2. Enable learning and working with various AI tools.
3. Acquaint advanced AI techniques and concepts to work on real-life data sets to form decision trees and clusters.
4. Learn various classification techniques.
5. Introduce basic concepts and techniques in ML algorithms.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand the significance of AI and Tools.
2. Apply regression and classification concepts to real-world problems.
3. Perform clustering operations using appropriate algorithms.
4. Implement AI concepts using Python.
5. Perform predictive analysis using ML algorithms.
6. Understand the fundamentals of Deep Learning and Neural Networks.

UNIT - I
Principles of Artificial Intelligence: Introduction to AI & ML, Real world problems, Fields and applications of AI, AI Tools and E-Learning Models, role of Python in AI, brief introduction to NumPy library, Python for Game AI. Breadth First and Depth First Search.

UNIT - II
Heuristics: Tic-Tac-Toe, Path-finding with A* Algorithm, A* Algorithm, Game AI with Alpha-Beta Pruning.

UNIT - III
Regression: Linear Regression with one variable, fitting model on data with Scikit-Learn, linear Regression with multiple variables, preparing data for Protection, Polynomial and Support Vector Regression.

UNIT - IV
Classification: Fundamentals of Classification, KNN, SVM, Introduction to Decision Trees, Entropy, Gini Index, Precision and Recall, Random Forest classifier.

UNIT - V
Clustering: Introduction, K-Means algorithm, Mean Shift Algorithm, Deep Learning with Neural Networks: TensorFlow for Python, Introduction to Neural Networks, Forward and Backward Propagation, training the TensorFlow Model, Deep Learning.

Text Books:

1. Zsolt Nagy, “Artificial Intelligence and Machine Learning Fundamentals”, Packt Publishing Limited, 2018.
2. Dr. Venkat Nagendra, “Fundamentals AI & ML”, AkiNik Publications, 2021.
3. Dr. Dheeraj Malhotra, “Basics of Artificial Intelligence and Machine Learning”, Notion Press, 2019.

20CSE05

OPTIMIZATION TECHNIQUES
(Professional Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Mathematical Foundation for Data Science and Security.

Course Objectives: The objectives of this course are,

1. To identify and develop optimization techniques from the verbal description of real system.
2. To learn different techniques to get optimum solution LPP.
3. To understand the Mathematical representations that are needed to solve optimization problem.
4. To analyze the results of the different real-world problems.
5. To construct network and find critical path using network scheduling technique

Course Outcomes: On Successful completion of this course, student will be able to,

1. Calculate the optimum values for given objective function by LPP.
2. Solve the solution for maximize the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for assignment and travelling salesman problems and computing the optimal solution for Job sequencing models.
4. Compute the optimum values for given objective function by IPP and optimal strategy for games.
5. Identify critical path using network scheduling.

UNIT - I

Introduction to Operations Research: Basics definitions, objectives, models, application and limitations. Linear Programming (LP) - Mathematical Formulation of LP problem, Graphical Method, Some Exceptional Cases, Simplex Method - Introduction, computational procedure, artificial variables technique - big-M method and 2-phase method.

UNIT - II

Introduction, Mathematical Formulation of transportation Problem, Balanced / Unbalanced, Minimization / Maximization, Determination of the initial basic feasible solution using (i) North-West Corner Rule (ii) Least cost method & (iii) Vogel's approximation method for balanced & unbalanced transportation problems. Optimality Test & obtaining of optimal solution (Considering per unit transportation cost) using MODI method and steppingstone method.

UNIT - III

Introduction, Mathematical Formulation of Assignment Problem, Hungarian method for optimal solution, Solving unbalanced problem, Traveling salesman problem, Sequencing models, Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.

UNIT - IV

Integer Programming Problem: Introduction, Types of Integer Programming Problems, Gomory's All-IPP Method, All IPP Algorithm, Branch and Bound Technique Game and strategies: Introduction, Game with maximin-minimax principle (Pure Strategies), Game with Mixed Strategies, Dominance Property, Graphical Method for 2 X n or m x 2 Games, Linear Programming Approach for Game Theory.

UNIT - V

Construction of Network – Rules & Precautions, C.P.M. & P.E.R.T. Networks, Obtaining of Critical Path, Time estimates for activities, Probability of completion of project, Determination of floats (total, free, independent).

Text Books:

1. Kanti Swarup, P. K. Gupta, Man Mohan, "Operations Research", Sultan Chand Publications, 2010.
2. R. Pannerselvam, "Operations Research", PHI, 2nd Edition, 2016.

Suggested Reading:

1. Deb K. “Optimization for Engineering Design Algorithms and Examples”, PHI, 2000.
2. Arora J. “Introduction to Optimization Design”, Elsevier Academic Press, New Delhi, 2004.
3. Saravanan R. “Manufacturing Optimization through Intelligent Techniques”, Taylor & Francis (CRC Press), 2006.
4. Hardley G. “Linear Programming”, Narosa Book Distributors Private Ltd., 2002.

Online Resources:

1. https://nptel.ac.in/courses/111105039
2. https://nptel.ac.in/courses/105108127

20CSE12

EMBEDDED SYSTEMS
(Professional Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Computer architecture and microprocessor, Digital logic design, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To be aware of general computing system, embedded system and classification of embedded system.
2. To analyze the core concepts of embedded system and its architecture.
3. To analyze the RTOS for embedded systems.
4. To learn embedded system development environment.
5. To learn to use tools in embedded software development process.

Course Outcomes: On successful of the course student will be able to,

1. Understand the basics of embedded systems.
2. Analyze the core concepts of Embedded System and Embedded System Architecture.
3. Design and develop Embedded System hardware and software using Embedded C.
4. Analyze the operating system for embedded systems.
5. Analyze the embedded system development environment and tools used in embedded software development process.

UNIT - I

Introduction to Embedded Systems: Embedded Systems, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, Examples of embedded systems, Design process in Embedded system, Formalization of system design, Design process and design examples(smart card, digital camera, mobile phone), Classification of Embedded Systems, Skills required for embedded system designer.

UNIT - II

Inter process communication and synchronization of processes, Threads and Tasks. Multiple processes in an application, Multiple threads in an application, Tasks, Task states, Task and data, Clear cut distinction between functions, ISRs and tasks and their characteristics. Concept of semaphores, Shared data, Inter process communication, Signal function, Semaphore functions, Message queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions.

UNIT - III

Real time operating systems: OS services, Process management, Timer functions, Event functions, Memory management, Device , File, IO subsystems management, Interrupt routine in RTOS environment and handling of Interrupt source calls, RTOS, RTOS task scheduling models, Interrupt latency, Response of tasks as performance metrics, OS security issues.

UNIT - IV

8051 interfacing with displays (LED, 7 segment display, LCD), Switch, Relay, Buzzer, D/A and A/D converters, Stepper motor.

Networked Embedded systems, Serial communication protocols, I2C bus, CAN bus, RS232, Introduction to advanced architectures: ARM and SHARC.

UNIT - V

Embedded software Development process tools: Introduction to embedded software development process and tools, Host and Target machines, linking and locating software, Getting embedded software into target system, Issues in hardware - software design and Co-design.

Testing, simulation and debugging techniques and tools: Testing on host machine, Simulators, Laboratory tools

Text Books:

1. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education India, 2009.

Suggested Reading:

1. David E. Simon, “An Embedded Software Primer”, Pearson Education, 1999.
2. Wayne Wolf, “Computers as Components: Principles of Embedded Computing System Design”, Elsevier, 2008.

20ECO10

FUNDAMENTALS OF WIRELESS COMMUNICATION
(Open Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: A course on basics of electronics is required.

Course Objectives: The objectives of this course are,

1. To familiarize the concepts related to cellular communication and its capacity.
2. To teach students the fundamentals of propagation models and multipath fading.
3. To describe diversity schemes applied in wireless communication and understand the latest Wireless technologies.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Understand the overview of Wireless Communication.
2. Relate the cellular concepts like frequency reuse, hand off, coverage and capacity.
3. Analyse the mobile radio propagation with large scale and small scale fading.
4. Select the suitable diversity technique to combat the multipath fading effects.
5. Compare the multiple access techniques and apply to wireless standards.

UNIT - I

An overview of wireless communications: Roadmap of cellular communications. First-Generation systems. Second-Generation systems. Third-Generation systems, Fourth-Generation systems and Fifth-Generation Systems.

UNIT - II

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies. Handoff Strategies. Interference and System Capacity. Power Control for Reducing Interference.

UNIT - III

Mobile Radio Propagation: Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, the Three Basic Propagation Mechanisms, **Small-Scale Fading and Multipath:** Small-Scale Multipath Propagation, Factors Influencing Small-Scale Fading, Doppler Shift, Types of Small-Scale Fading.

UNIT - IV

Diversity Techniques: Practical Space Diversity Considerations- Selection Diversity, Feedback or Scanning, Maximal Ratio Combining Diversity Equal Gain Combining. **Orthogonal frequency division multiplexing:** Introduction, Principle of OFDM. OFDM transceivers Cyclic prefix, Spectrum of OFDM, Fading mitigation in OFDM. Intercarrier interference.

UNIT - V

Multiple access techniques: Duplexing: FDD versus TDD. FDMA. TDMA. CDMA. OFDMA. SDMA
Wireless Standards: Global System for Mobile (GSM). GSM Services and Features, GSM System Architecture, GSM Radio Subsystem. GPRS and EDGE- features.

Text Books:

1. Theodore S. Rappaport - Wireless Communications Principles and Practice, 2nd Edition, Pearson Education, 2003.
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, First Edition, 2005.
3. Ke-Lin Du, Concordia University, Montréal,M. N. S. Swamy- Wireless Communication Systems.From RF Subsystems to 4G Enabling Technologies. April 2010.

Suggested Reading:

1. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015
2. Andreas F.Molisch - Wireless Communications John Wiley, 2nd Edition, 2006.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.

20EEO05

WASTE MANAGEMENT
(Open Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. To imbibe the concept of effective utilization of any scrap.
2. To become familiar with the processes of all disciplines of engineering.
3. To learn the technique of connectivity from waste to utility.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Categorize the waste based on the physical and chemical properties.
2. Explain the Hazardous Waste Management and Treatment process.
3. Illustrate the Environmental Risk Assessment, methods, mitigation and control.
4. Interpret the Biological Treatment of Solid and Hazardous Waste.
5. Identify the waste disposal options, describe the design and construction, Operation, Monitoring, Closure of Landfills.

UNIT - I

Introduction to waste management and Municipal Solid Waste Management: Classification of waste: Agro based, Forest residue, Industrial waste, e-Waste, Municipal Solid Waste Management: Fundamentals Sources, composition, generation rates, collection of waste, separation, transfer and transport of waste, treatment and disposal options.

UNIT - II

Hazardous Waste Management and Treatment: Hazardous Waste Identification and Classification, Hazardous Waste Management: Generation, Storage and collection, Transfer and transport, Processing, Disposal, Hazardous Waste Treatment: Physical and Chemical treatment, Thermal treatment, Biological treatment, Pollution Prevention and Waste Minimisation, Hazardous Wastes Management in India.

UNIT - III

Environmental Risk Assessment: Defining risk and environmental risk, Parameters for toxicity quantification, Types of exposure, Biomagnifications, Effects of exposure to toxic chemicals, risk analysis and risk matrix, methods of risk assessment, mitigation and control of the risk, case studies.

UNIT - IV

Biological Treatment: Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation.

UNIT - V

Waste Disposal: Key Issues in Waste Disposal, Disposal Options and Selection Criteria: Disposal options, Selection criteria, Sanitary Landfill: Principle, Landfill processes, Landfill Gas Emission: Composition and properties, Hazards, Migration, Control, Leach ate Formation: Composition and properties. Leach ate migration, Control, Treatment, Environmental Effects of Landfill, Landfill Operation Issues, Design and construction, Operation, Monitoring, Closure of Landfills - Landfill Remediation, national and International Waste management programs.

Text Books:

1. John Pichtel “Waste Management Practices”, CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D.Buckingham,P.L. and Evans, J.C. Hazardous “Waste Management”, McGraw Hill International Editions, New York, 1994.
3. Richard J. Watts, Hazardous “Wastes - Sources, Pathways, Receptors”, John Wiley and Sons, New York, 1997.

Suggested Reading:

1. Basics of Solid and Hazardous Waste Mgmt. Tech. by KantiL.Shah 1999, Prentice Hall.
2. Solid and Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers & Dist.

20MEO09

ORGANIZATIONAL BEHAVIOUR
(Open Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. Define basic organizational behavior principles and analyze how these influence behavior in the work place.
2. Analyze the influence of perceptions and personality on individual human behavior in the work place.
3. Discuss the theories of Motivation and Leadership.
4. Provide knowledge on different organizational structures; and concepts of culture, climate and organizational development and make the students familiarize with individual behavior.
5. Describe the interpersonal and their intrapersonal reactions within the context of the group and also demonstrate effective communication and decision making skills in small group settings.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand Organizational Behavioral principles and practices.
2. Compare various organizational designs and cultures enabling organizational development.
3. Apply motivational theories and leadership styles in resolving employee‘s problems and decision makingprocesses.
4. Understand the group dynamics, communication network, skills needed to resolve organizational conflicts.
5. Analyze the behavior, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behavior.

UNIT – I

Introduction: Organizational behaviour, nature and levels of organizational behavior, individuals in organization, individual differences , personality and ability, the big 5 model of personality , organizationally relevant personality traits, the nature of perception , characteristics of the perceiver, target and situation, perceptual problems.

UNIT – II

Organization structure: Organizational designs and structures, traditional and contemporary organizational designs, organizational culture and ethical behavior , factors shaping organizational culture, creating an ethical culture, concepts, organizational climate, organization conflict, and organization development.

UNIT – III

Motivation and leadership: Motivation, early and contemporary theories of motivation, leadership, early and contemporary approaches to leadership.

UNIT – IV

Group dynamics: Groups and group development, turning groups into effective teams, managing change , process, types and challenges, communicating effectively in organizations, communication process, barriers to communication, overcoming barriers to communication, persuasive communication, communication in crisis situations.

UNIT – V

Power, Politics, Conflict and Negotiations: Power, politics, conflict and negotiations, sources of individual, functional and divisional power, organizational politics conflict, causes and consequences, Pondy‘s model of organizational conflict, conflict resolution strategies.

Text Books:

1. Jennifer George and Gareth Jones, "Understanding and Managing Organizational Behavior", Pearson Education Inc., 2012.
2. Jon L Pierce and Donald G. Gardner, "Management and Organizational behavior", Cengage Learning India (P) Limited, 2001.
3. Richard Pettinger, "Organizational Behaviour", Routledge, 2010.

Suggested Reading:

1. Stephen P. Robbins, Jennifer George and Gareth Jones, "Management and Organizational Behaviour", Pearson Education Inc., 2009.
2. John Schermerhorn, Jr., James G. Hunt and Richard N. Osborn, "Organizational Behaviour", 10th edition, Wiley India Edition, 2009.

20MTO03

QUANTUM COMPUTING
(Open Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. To learn Quantum bits and compute mathematical foundation
2. To understand the evaluation of the quantum bits.
3. To learn Quantum operations by building blocks of Quantum programming
4. To know the basics of Quantum logic gates and circuits
5. To learn Quantum Algorithms by various Techniques.

Course Outcomes: On Successful completion of the course, students will be able to

1. Compute basic mathematical operations on Quantum bits.
2. Execute Quantum operations of Quantum computing
3. Built quantum programs
4. Develop quantum Logical gates and circuits.
5. Develop the quantum algorithm

UNIT - I

Math Foundation for Quantum Computing: Introduction of Vector Space, Subspaces, Basis and Finite Dimensions. Vectors and orthogonality, inner product and Outer product and Hilbert Spaces. Formation of Matrices by Linear Transformation. Linear Independent and dependent Vectors. Unitary operators and projectors, Eigen values and Eigen Vectors.

UNIT – II

Introduction to Quantum Computing: Quantum Mechanics (Huygens wave theory ,Photo electric effect De-Broglie hypothesis and Heisenberg's uncertainty Principle), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting ,Qubits and multi-qubits states, Bra-ket notation, Quantum Superposition Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave.

UNIT – III

Building Blocks for Quantum Program: Block sphere representations, Multi-qubits, Inner and outer product of Multiple of qubits, Tensor product, Quantum Entanglement, Quantum Teleporation (EPR Model) and Bell State.

UNIT – IV

Quantum Logical gates and Circuits: Pauli, Hadamard, Phase shift, controlled gates, AND, OR and NAND gate, C-Not, CCNOT gate Introduction of Fourier Transform and Discrete Fourier transform.

UNIT – V

Quantum Algorithms: Z-Transform. Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Quantum Phase estimation, Quantum walks), Major Algorithms (Shore's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm).

Text Books:

1. David McMahon, "Quantum Computing Explained", Wiley-IEEE Computer Society Pr., 2008.

Suggested Reading:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press, 2010.

20BTO04

BIOINFORMATICS
(Open Elective – I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisites: The school level basic knowledge in Fundamental science is required.

Course Objectives: The objectives of this course are,

1. To provide elementary knowledge in biology and bioinformatics and biological information available to a biologist on the web and learn how to use these resources on their own.
2. To learn the fundamentals of biological databases, Sequence analysis, data mining, sequence alignment and phylogenetics.
3. To learn methods for determining the predictinggene and protein.

Course Outcomes: On Successful completion of the course, students will be able to

1. Explain the basic concepts of biology and bioinformatics.
2. Identify various types of biological databases used for the retrieval and analysis of the information.
3. Explain the sequence analysis and data mining.
4. Discuss the methods used for sequence alignment and construction of the phylogenetic tree.
5. Describe the methods used for gene and protein structure prediction.

UNIT - I

Introduction And Basic Biology: Bioinformatics- Introduction, Scope and Applications of Bioinformatics; Basics of DNA, RNA, Gene and its structure, Protein and metabolic pathway; Central dogma of molecular biology; Genome sequencing, Human Genome Project.

UNIT - II

Biological Databases: Introduction to Genomic Data and Data Organization, types of databases, biological databases and their classification, Biological Databases - NCBI, SWISS PROT/Uniport, Protein Data Bank, Sequence formats; Information retrieval from biological databases; Data mining of biological databases.

UNIT - III

Sequence Analysis and Data Mining: Scoring matrices, Amino acid substitution matrices- PAM and BLOSUM; Gap, Gap penalty; Database similarity searching - BLAST, FASTA algorithms to analyze sequence data, FASTA and BLAST algorithms comparison; Data Mining- Selection and Sampling, Pre-processing and Cleaning, Transformation and Reduction, Data Mining Methods, Evaluation, Visualization, Designing new queries, Pattern Recognition and Discovery, Text Mining Tools.

UNIT - IV

Sequence Alignment And Phylogentics: Sequence Alignment – Local and Global alignment; Pairwise sequence alignment – Dynamic Programming method for sequence alignment - Needleman and Wunsch algorithm and Smith Waterman algorithm. Multiple sequence alignment - Methods of multiple sequence alignment, evaluating multiple alignments, applications of multiple sequence alignment. Concept of tree, terminology, Methods of phylogenetic analysis, tree evaluation – bootstrapping, jackknifing.

UNIT - V.

Macromolecular Structure Prediction:

Gene prediction, - neural networks method, pattern discrimination methods, conserved domain analysis; Protein structure basics, protein structure visualization, Secondary Structure predictions; prediction algorithms; Chou-Fasman and GOR method, Neural Network models, nearest neighbor methods, Hidden-Markov model, Tertiary Structure predictions; prediction algorithms; homology modeling, threading and fold recognition, ab initio prediction.

Text Books:

1. David Mount, "Bioinformatics Sequence and Genome Analysis", 2nd edition, CBS Publishers and Distributors Pvt. Ltd., 2005.
2. Rastogi SC, Mendiratta N and Rastogi P, "Bioinformatics: Methods and Applications Genomics, Proteomics and Drug discovery", 3rdedition, PHI Learning Private Limited, New Delhi, 2010.

Suggested Reading:

1. Baxebanis AD and Francis Ouellette BF, "Bioinformatics a practical guide the analysis of genes and proteins", 2nd edition, John Wiley and Sons, Inc., Publication, 2001.
2. Vittal R Srinivas, "Bioinformatics: A modern approach. PHI Learning Private Limited", New Delhi, 2009.
3. JiXiong, "Essential Bioinfomatics", Cambridge University Press, 2006.

20CSC23

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Operating systems, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To explore Unix/Linux operating system.
2. To analyze various system calls available in Linux/Unix.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Understand Linux/Unix environment.
2. Identify and interpret various system programs.
3. Understand and implement shell programming.
4. Simulate memory management and file allocation techniques.
5. Analyze process and file management system calls by creating and/or modifying concurrent programs.
6. Build network-oriented applications using system calls.

LIST OF EXPERIMENTS:

1. Shell programming.
2. Implementation of memory management techniques like paging and segmentation.
3. Implementation of Linked, Indexed and Contiguous file allocation methods.
4. Demonstration of Linux/Unix file related system calls: mkdir, link, unlink, mount, unmount, users+, chown, chmod, open, close, read, write, lseek, stat, sync.
5. Demonstration of Linux/Unix process related system calls: fork, wait, exec, exit, getpid, getuid, setuid brk, nice, sleep.
6. Development of applications using Linux/Unix system calls: signal, socket, accept, snd, recv, connect.

Text Books:

1. Galvin, Silberschatz, “Operating System Concepts”, 10th Edition, John Wiley & Sons, 2018.
2. Dhananjay Dhamdhare, “Operating Systems-A Concept Based Approach”, 3rd Edition, McGraw Hill Education, 2017.

Suggested Reading:

1. Ekta Walia, “Operating System Concepts”, Khanna Book Publishing, 2020.
2. William Stallings, “Operating Systems Internals and Design Principles”, Pearson Ed., 2012.
3. Charles Crowley, “Operating Systems –A Design Oriented Approach”, McGraw Hill Education, 2017.
4. Andrew S. Tanenbaum, Albert S Woodhull, “Operating systems Design and Implementation”, Pearson Ed., 2009.

20CIC05

IOT DEVELOPMENT, APPLICATIONS AND PRACTICE LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: CAMP, Programming Basics.

Course Objectives: The objectives of this course are to

1. Understand the basics of IoT.
2. Impart necessary and practical Skills using components of Internet of Things.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On successful completion of the course, students will be able to

1. Use of various hardware and software components related to Internet of Things.
2. Interface I/O devices, sensors to Raspberry Pi/Arduino.
3. Implement various communication protocols in IoT.
4. Monitoring remote system using IoT.
5. Hypothesizing Real time IoT based projects.
6. Develop real life IoT based projects.

LIST OF EXPERIMENTS:

1. Introduction to IoT devices and perform necessary software installation.
2. Write a program to interface PIR sensor with Arduino and turn ON LED when motion is detected.
3. Write a program to interface DHT22 sensor with Arduino and display temperature and humidity readings.
4. Write a program to interface motor with Raspberry Pi. Turn ON motor when the temperature is high.
5. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
6. Write a program to send sensor data to smart phone using Bluetooth.
7. Write a program to interface flame/smoke sensor with Arduino /Raspberry Pi and give an alert message when flame/smoke is detected.
8. Perform experiment with GPS module by interfacing with Arduino/Raspberry Pi.
9. Write a program to send and receive messages using MQTT protocol.
10. Write a program to upload sensor data to local/cloud server using wifi.
11. Write a program to retrieve sensor data from local/cloud server.
12. Implement any case study using Arduino/Raspberry Pi.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.

4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, "Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Series in Communications, 2013.

Online Resources:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey ", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What's The Difference Between IEEE 802.15.4 And ZigBee Wireless?", Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo *et al*., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

20CIC06

COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Basics of Operating System, Linux Commands.

Course Objectives: The objectives of this course are to

1. Learn about communication media, devices, and protocols.
2. Learn to gain practical knowledge of computer networks configuration and monitoring.
3. Create network simple computer networks using simulation tools.

Course Outcomes: On successful completion of the course, students will be able to

1. Identify the different types of connecting Medias and equipment's used in the networks Lab.
2. Differentiate various network devices like repeater, hub and switch.
3. Practice the basic network commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design and demonstrate network topologies using GNS3.
5. Examine the packet transfer using tcpdump.
6. Analyze the network performance using Wire shark or any tool.

LIST OF EXPERIMENTS:

1. Study of Network media, cables, and devices and Cable Construction.
2. Demonstration of basic network commands/ utilities (both in Windows and Linux).
3. PC Network Configuration.
4. Building a switch-based network / Configuration of Cisco Switch CBS250-24T-4G 24-Port.
5. Configuration of Cisco Router ISR-4331.
6. Configuration of VLAN in Cisco switch.
7. Develop different local area networks using GNS3. Connect two or more Local area networks. Explore various sub-netting options.
8. Configure Static routing using GNS3 tool.
9. Basic OSPF configuration using GNS3 tool.
10. Basic EIGRP Configuration using GNS3 tool.
11. Analysis of network traces using tcpdump.
12. Analysis of network traces using Whireshark.

Text Books:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for-windows-linux-and- macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/
5. https://www.gns3.com/

20CII02

INTERNSHIP-II
(Industrial / Rural Internship)

Instruction	3 to 4 weeks/90 hours
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	2

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum(R-20) 2022-23

B.E. (CSE - IOT & Cyber Security including Blockchain Technology)

SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20CIC07	Theory of Computation and Compilers	3	-	-	3	40	60	3
2	20CSC22	Software Engineering	3	-	-	3	40	60	3
3	20CIC08	Blockchain Platforms and Applications	3	-	-	3	40	60	3
4		Professional Elective – II	3	-	-	3	40	60	3
5		Open Elective-II	3	-	-	3	40	60	3
6	20EGM03	Universal Human Values-II Understanding Harmony	3	-	-	3	40	60	3
PRACTICAL									
7	20CSC25	Case Studies using UML Lab	-	-	2	3	50	50	1
8	20CIC09	Blockchain Platforms and Applications Lab	-	-	3	3	50	50	1.5
9		Professional Elective – II Lab	-	-	2	3	50	50	1
10	20EGC03	Employability Skills	-	-	2	2	50	50	1
TOTAL			**18**	**-**	**09**	-	**440**	**560**	**22.5**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Exam

PROFESSIONAL ELECTIVE-II	
20CIE04	Sensors and Sensing Technologies
20CIE05	Vulnerability Analysis and Penetration Testing
20CSE06	Soft Computing
20CSE23	Mobile Application Development
20CSE37	High Performance Computing

OPEN ELECTIVE-II	
20ECO01	Remote Sensing and GIS
20MTO01	Financial Mathematics
20EEO02	Energy Management Systems
20EGO01	Technical Writing Skills
20CEO02	Disaster Risk Reduction and Management
20CHO04	Environmental and Sustainable Development

PROFESSIONAL ELECTIVE-II LAB	
20CIE06	Sensors and Sensing Technologies Lab
20CIE07	Vulnerability Analysis and Penetration Testing Lab
20CSE15	Soft Computing Lab
20CSE32	Mobile Application Development Lab
20CSE40	High Performance Computing Lab

20CIC07

THEORY OF COMPUTATION AND COMPILERS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Algorithms.

Course Objectives: The objectives of this course are to

1. Learn the foundations of automata theory, computability theory, and complexity theory. Shows relationship between automata and formal languages.
2. Addresses the issue of which problems can be solved by computational means (decidability vs undecidability).
3. Learn the concepts related to computational complexity of problems.
4. Understand the concept of algorithm and compare the complexity of problems.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand formal language basics and the power of automata to recognize the languages.
2. Analyze the concept compilation Process and data structures of a compiler.
3. Attains the knowledge of context free grammars and able to implement parsers.
4. Design Syntax directed translation scheme for a given Context free grammar and generation of intermediate code.
5. Apply Optimization to intermediate code and machine code.
6. Illustrate various object forms, error recovery and tools of a compiler.

UNIT – I

Formal Language and Regular Expressions: Chomsky hierarchy, Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA.

Overview of Compilation: phases, Lexical Analysis, Lex Specifications, Structure of a Lex Specification File, Regular Grammar and Regular Expression for Common Programming Language Features, Pass and Phases of Translation, Interpretation, Bootstrapping, Data Structures of Compiler, LEX tool.

UNIT – II

Context Free grammars and parsing: Context free grammars, derivation, parse trees, ambiguity, Types of Parsers LL(K) grammars and LL(1) parsing.

Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, Error Recovery in Parsing YACC programming specification.

UNIT – III

SEMANTIC ANALYSIS: Intermediate Forms of Source Programs - Abstract Syntax Tree, Polish Notation and Three Address Codes. Attributed Grammars, Syntax Directed Translation, Language Intermediate Code Forms, Type Checker. Symbol Table: Symbol Table Format, Organization for Block Structures Languages, Hashing.

UNIT – IV

CODE OPTIMIZATION: Consideration for Optimization, Scope of Optimization, Local Optimization, Loop Optimization, Frequency Reduction, Folding, DAG Representation. Data Flow Analysis: Flow Graph, Data Flow Equation, Global Optimization, Redundant Sub Expression Elimination, Induction Variable Elements, Live Variable Analysis, Copy Propagation.

UNIT – V

OBJECT CODE GENERATION: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms.

Error Recovery: various errors in phases and recovery of errors in compilation, introduction to tools of compiler.

Text Books:

1. John E. Hopcroft, Rajeev M & J D Ullman: "Introduction to Automata Theory Languages &Computation", 3rd Edition, Pearson Education, 2007.
2. Aho, Ullman, Ravisethi: "Compilers Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2009.

Suggested Reading:

1. Andrew W.Appel "Modern Compiler Construction in C", Cambridge University Press.
2. LOUDEN & Thomson, Compiler Construction.
3. A. Meduna, Elements of Compiler Design, Auerbach Publications, Taylor and Francis Group.
4. V. Raghavan, Principles of Compiler Design, TMH.
5. K. D. Cooper, L. Torczon, Engineering a Compiler, ELSEVIER.
6. Kamala Krithivasan and Rama R, Introduction to Formal Languages and Automata Theory and Computation Pearson.
7. D. Grune and others, Modern Compiler Design, Wiley-India.
8. S. F. B. Nasir, P. K. Srimani, A Text book on Automata Theory, Cambridge Univ. Press.
9. A. Meduna, Automata and Language, Springer.

20CSC22

SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Object oriented programming, Programming for problem solving, Database management systems.

Course Objectives: The objectives of this course are,

1. To understand the Software Engineering Practice and Process Models.
2. To understand Design Engineering and Project Management in Software Development.
3. To gain knowledge in software testing and overall project activities.

Course Outcomes: On Successful completion of this course, student will be able to,

1. State the software process and explain perspective process model, evolutionary process models.
2. Understand the agile Software process models and demonstrate the skills necessary to specify the requirements of software product so as to prepare SRS document.
3. Recall the modeling concepts and estimate the cost of software using empirical models.
4. Enlist the design principles and construct a product using coding principles and standards.
5. Develop test cases and apply software testing methods in conventional and O-O approaches and estimates software quality of SW.

UNIT - I

Introduction to Software Engineering: The nature of Software, Software Engineering, Software Engineering Practice, The Software Process**,** Software Engineering Practice **Process Models:** A Generic Process Model, Process assessment and Improvement, Prescriptive Process Models: Waterfall Model, Incremental Process Models, RAD Model, Evolutionary Process Models - Prototyping, The Spiral Model, Concurrent Models, Specialized Process Models.

UNIT - II

An Agile Development: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD), Scrum, Dynamic Systems Development Method (DSDM), Feature Driven Development (FDD), Agile Modeling (AM), **Requirement Engineering,** Establishing the groundwork, Eliciting Requirements, Negotiating Requirements, and Validating Requirements. **Software Requirements Analysis and Specification**: Value of a Good SRS, Problem Analysis, Requirements Specification, Components SRS, Structure of a Requirements Document.

UNIT - III

Flow-Oriented Modeling, **Planning a software Project**: Effort Estimation, Project Schedule and Staffing, Quality Planning, Risk Management, **Estimation for Software Projects:** Decomposition Techniques - Software Sizing, Problem-Based Estimation, An Example of LOC-Based Estimation, An Example of FP-Based Estimation.

UNIT - IV

Design Concepts: Coupling, Cohesion, The Open-Closed Principle, Function-Oriented Design - Structure Charts, Structured Design Methodology, An Example, Software Architecture, A Brief Taxonomy of Architectural Styles, C**omponent-Level Design:** Definition, Basic Design Principles, Design Guidelines, Designing Traditional Components, Coding Principles and guidelines, Incremental Development of Code, Code Inspection – Planning, Self-Review, Group Review Meeting.

UNIT - V

Testing - Testing Concepts, Testing Process, **Testing Strategies**: A Strategic approach to software testing, strategic issues, test strategies for Conventional Software, Validation Testing, System Testing, White Box Testing, Black Box. Software Review Techniques - Informal Reviews Formal Technical Reviews, Quality Concepts - What is Quality, Software Quality.

Text Books:

1. Roger S. Pressman “Software Engineering: A practitioner's approach”, McGraw Hill, 7th Edition, 2010.
2. Pankaj Jalote “A concise Introduction to Software Engineering”, Springer, Kindle Edition, 2008.

Suggested Reading:

1. Sommerville “Software Engineering”, 10th Edition, Pearson, 2016.
2. Rajib Mal “Fundamental of Software Engineering”, 4th Edition, PHI Learning, 2014.

Online Resources:

1. https://nptel.ac.in/courses/106101061/

20CIC08

BLOCKCHAIN PLATFORMS AND APPLICATIONS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Distributed Systems, Computer Networks.

Course Objectives: The objectives of this course are to

1. Introduce the fundamental design and architectural primitives of Blockchain and consensus protocols.
2. Explore various blockchain platforms.
3. Understand and develop smart contracts and decentralized applications.
4. Understand the significance of Hyperledger Fabric and composer.
5. Apply blockchain securely in various sectors ranging from Financial to Government.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand the fundamental design and architectural primitives of Blockchain and consensus protocols.
2. Explore various blockchain platforms and identify the significance of smart contracts.
3. Identify the working of Ethereum and decentralized applications.
4. Implement the blockchain applications with Hyperledger Fabric and Composer.
5. Apply blockchain in different application domains such as financial and supply chain sectors.
6. Analyze the Implications of blockchain for privacy and security.

UNIT – I

Introduction to Blockchain: Basics, History, Need of Blockchain, Architecture, Blockchain components, Merkle Tree, Transactions, Hash functions, digital signatures.

Consensus Protocols: Proof of Work (PoW), Proof of Stake (PoS), Permissioned Blockchain: RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance.

UNIT – II

Introduction to blockchain platforms: Ethereum, Hyperledger, IBM Blockchain, BigChainDB, IPFS, Dapps.

Introduction to smart contracts: Basic description of smart contracts, history of smart contracts, smart contracts operations and management.

UNIT – III

Ethereum Blockchain-concepts and terminologies, Transaction and Block in Ethereum, Ethereum Client, Mist Wallet, Accounts, Ethereum Smart Contracts, Ethereum Virtual Machine (EVM), Byte Code interpretation, Ethereum mining reward scheme, gas pricing.

Decentralized application development: Introduction to DApps development, Native application development using Java (with RPC) verses JavaScript applications.

UNIT – IV

Hyperledger Fabric – Blockchain for Enterprise, Overview, Transaction Flow, Hyperledger Fabric Details, Fabric – Membership and Identity Management, Hyperledger Fabric Network Setup, Hyperledger Composer – Application Development.

Use Case I : Blockchain in Financial Service : Payments and Secure Trading, Compliance and Mortgage, Financial Trade.

UNIT – V

Use Case II: Blockchain in Supply Chain, Blockchain in Government: Digital Identity, Applications in the field of Healthcare and Education Sector, Use Case III : Implications of blockchain technology for digital privacy and Security.

Text Books:

1. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020, ISBN: 9781839213199.
2. Herbert Jones, Blockchain (1 ed.), Create Space Independent Publishing Platform, 2017. ISBN 978-1977971708.
3. Larry A. DiMatteo, Michel Cannarsa, Cristina Poncib, The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms (1 ed.), Cambridge University Press, 2019. ISBN 978-1108492560.

Suggested Reading:

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
2. Gaur and Nitin, Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric an (1 ed.), Packt Publishing Ltd, 2018. ISBN 978-1788994521.

Online Resources:

1. https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199
2. https://www.cse.iitk.ac.in/users/emasters/courses/Introduction%20to%20Blockchain%20Technology.html
3. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
4. https://onlinecourses.nptel.ac.in/noc20_cs01/preview

20CIE04

SENSORS AND SENSING TECHNOLOGIES
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: IoT development, applications and practice.

Course Objectives: The objectives of this course are to
1. Identify various types of sensors used in IoT.
2. Illustrate connection of sensors to processing devices.
3. Understand communication mechanism and IEEE standards used for IoT sensing.

Course Outcomes: On successful completion of the course, students will be able to
1. Understand and summarize different types of sensors/transducers.
2. Illustrate the mechanism to connect the sensors to processing devices.
3. Demonstrate the communication mechanism for IOT sensors.
4. Apply different techniques to improve sensor IQ.
5. Analyze various aspects of network communication.
6. Understand IEEE standards for smart sensing.

UNIT – I

Fundamentals of Sensors: What are sensors/trasnducers?, Principles, Classification, Parameters, Environmental Parameters and Characterization.

Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain gauge, Inductive Sensors, Capacitive Sensors, Force/Stress sensors.

UNIT – II

Thermal Sensors: Introduction, Gas Thermometric Sensors, Thermal Expansion type thermometric sensors, Dielectric constant and refractive index thermosensors, magentic thermometer, resistance change type thermometric sensors, thermoemf sensors, noise thermometry, heat flux sensors.

Magnetic sensors: Introduction, Sensors and principles, magnetoresistive sensors, inductive and eddy current sensors, Angular/Rotary movement sensors, SQUID sensors.

UNIT – III

Electroanalytical Sensors: Introduction, Electrochemical cell, cell potential, SHE, Liquid junction and other potentials, polarization, reference electrodes, Sensor electrodes, electroceramics in gas media, ChemFET.

Getting Sensor Information into the MCU: Introduction, Amplification and Signal Conditioning, Digital Conversion.

UNIT – IV

Using MCUs/DSPs to Increase Sensor IQ: Introduction, MCU Control, MCUs for Sensor Interface, DSP Control, Techniques and Systems Considerations, Software, Tools, and Support, Sensor Integration.

Communications for Smart Sensors: Introduction, Definitions and Background, Sources (Organizations) and Standards, Automotive Protocols, Industrial Networks, Office/Building Automation, Home Automation, Protocols in Silicon, Other Aspects of Network Communications.

UNIT – V

Mechatronics and Sensing Systems: Introduction, Smart-Power ICs, Embedded Sensing, Sensing Arrays, Other System Aspects Standards for Smart Sensing: Introduction, Setting the Standards for Smart Sensors and Systems, IEEE 1451.1, IEEE 1451.2, IEEE P1451.3, IEEE P1451.4, Extending the System to the Network.

Text Books:

1. Patranabis D, “Sensors and Transducers,” Prentice Hall.
2. Frank R, “Understanding Smart Sensors”, Artech House.

Suggested Reading:

1. Callaway EH, “Wireless Sensor Networks : Architecture and Protocols,” Auerbach Publications.
2. Anand MMS, “Electronic Instruments and Instrumentation Techniques,” Prentice Hall.
3. IEEE Standard 1451, “Smart Transducer Interface for Sensor and Actuators”.

Online Resources:

1. https://www.arrow.com/en/research-and-events/articles/sensor-technologies?
2. yokogawa.com/special/sensing-technology

20CIE05

VULNERABILITY ANALYSIS AND PENETRATION TESTING
(Professional Elective-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are to

1. Get exposed to Virutalbox and setting up the Ubuntu Linux Desktop asa well exploiting a Backdoor.
2. Learn with networking fundamentals, capturing the network traffic and analysing the network packets.
3. Learnt with various networking attacks.
4. Learn to analyze network protocols for vulnerabilities.

Course Outcomes: On successful completion of the course, students will be able to

1. Explain the basic principles and techniques of how attackers can enter computer systems.
2. Describe and distinguish key phases of ethical hacking: reconnaissance, scanning, gaining access, maintaining access, and covering the tracks.
3. Put acquired knowledge into practice by performing ethical penetration tests and hide the intrusion.
4. Experience on various tools & techniques of vulnerability assessment & penetration testing used in Linux.
5. Identify flaws and vulnerabilities in applications, websites, networks, systems, protocols and configurations using both manual techniques and assistive tools.
6. Evaluate the strengths and weaknesses of various information technology solutions in terms of data security.

UNIT - I

Experimental Setup. Virtual Lab- Setting Up VirtualBox -Setting Up Metasploitable -Setting Up Kali Linux- Setting Up the Ubuntu Linux Desktop- Exploiting a Backdoor in Metasploitable- Getting the IP Address of the Metasploitable Server- Using the Backdoor to Gain Access.

UNIT - II

Network Fundamentals. Packets and Internet Protocol Stack. Viewing Packets in Wireshark. How the Internet Transmits Data: Packets, MAC Addresses, IP Addresses, and ARP Tables. ARP Spoofing Attacks. Performing and Detecting ARP Spoofing Attack. Analyzing Packets Collected by Firewall. Capturing Traffic on Port 80.

UNIT - III

Network Attacks. Sockets and Process Communication. TCP Handshake. Scanning for Open Ports. Writing TCP server. SYN Floods and detecting SYN Scans. Detecting XMas Scans. LAND Attack detection. Ping-of-Death Attack. Botnets and DDoS attacks.

UNIT - IV

Social Engineering and Network Attacks. Google Dorking. Scanning the Entire Internet: Masscan and Shodan. IPv6 and NAT Limitations. Vulnerability Databases: CVE, Mitre and NVD. Vulnerability Scanners. nmap Scans. Nessus scans.

UNIT - V

Fuzzing and Testing. Case Study: Exploiting the Heartbleed OpenSSL Vulnerability. Fuzzing. Fuzzing with Python. Fuzzing with Spike Scripts. Symbolic Execution. Dynamic Symbolic Execution. Fuzzing Web Protocols. Fuzzing an Open Source Project. Concolic Testing.

Text Books:

1. Daniel G. Graham, Ethical Hacking: A Hands-on Introduction to Breaking In October 2021, 376 pp. ISBN-13: 9781718501874 No Starch Press.

Suggested Reading:

1. Dennis Andriesse, Practical Binary Analysis Build Your Own Linux Tools for Binary Instrumentation, Analysis and Disassembly, December 2018, 456 pp. ISBN-13:9781593279127. No Starch Press.
2. Loren Kohnfelder, Designing Secure Software A Guide for Developers, November 2021, 312 pp. ISBN-13: 9781718501928 No Starch Press.

20CSE06

SOFT COMPUTING
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Linear Algebra & Calculus, Differential Equations & Transform Theory.

Course Objectives: The objectives of this course are,

1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Understand various soft computing concepts and techniques.
2. Analyze and design various learning models.
3. Apply the Neural Network Architecture for various Real time applications.
4. Examine and approximate reasoning using fuzzy logic.
5. Design Genetic algorithms in different applications.
6. Develop soft computing techniques to solve different applications.

UNIT - I

Soft computing vs. Hard computing, Various types of soft computing techniques.
Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III

Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory.
Associate Memory Networks: Bidirectional associative memory network, Hopfield networks.

UNIT - IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membershipfunctions, Defuzzification.

UNIT - V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:

1. S.N. Sivanandam& S.N. Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2011.
2. Soft Computing – Ikvinderpal Singh, Khanna Book Publishing 2015.

Suggested Reading:

1. S. Rajasekaran, G.A. Vijayalakshmipai, “Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications”, PHI publication, 2008.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, “Neural Networks in a Soft Computing Framework”, Springer International edition, 2008.
4. Simon Haykins, “Neural Networks a Comprehensive Foundation”, PHI, second edition.
5. Goldberg, David E., “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, New Delhi, 2002.
6. Learning and Soft Computing by Kecman, Pearson Education, 2001.

7. N.P. Padhy and S.P. Simon,"Soft Computing: With Matlab Programming", Oxford University Press, 2015.
8. Neuro fuzzy and soft computing by Jang, Pearson Education, 1996.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.
2. https://archive.nptel.ac.in/courses/106/105/106105173/

20CSE23

MOBILE APPLICATION DEVELOPMENT
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Programming for Problem solving, OOPs.

Course Objectives: The objectives of this course are,

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills in using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of the course, student will be able to,

1. Interpret and analyze Android platform architecture and features to learn best practices in android programming.
2. Design the User Interface for mobile applications.
3. Apply Intents, Broadcast receivers and Internet services in Android App.
4. Develop database management system to retrieve and/or store data for mobile application.
5. Evaluate and select appropriate android solutions to the mobile computing platform.
6. Build Flutter applications for complex problems.

UNIT - I

Introduction to Android Operating System: Android SDK Features, Developing for Android, Best practices in Android programming, Android Development Tools. Android application components – Android Manifest file, Externalizing resources, The Android Application Lifecycle, A Closer Look at Android Activities.

UNIT - II

Android User Interface: Introducing Layouts, User Interface (UI) Components – Editable and Non Editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. Event Handling – Handling clicks or changes of various UI components. Introducing Fragments, Multi-screen Activities.

UNIT - III

Intents and Broadcasts: Introducing Intents: Using Intents to Launch Activities. Using Intent to dial a number or to send SMS. **Broadcast Receivers** –Creating Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents. Finding and using Intents received within an Activity. Customizing the Action Bar, Using the Action Bar for application navigation, Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV

Persistent Storage: Files – Reading data from files, listing contents of a directory, Creating and Saving Shared Preferences, Retrieving Shared Preferences. Database –Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases. Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT - V

Advanced Topics: Alarms –Using Alarms. Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –Using Location-Based Services, Using the Emulator with Location-Based Services. Introduction to Flutter, Dart introduction, Data Types and Variables, String interpolation, Operators, Control Flow Statements, Functions, Classes, Read and write with Dart IO: Setup, Read and write with Dart IO: Final code.

Text Books:

1. Reto Meier, “Professional Android 4 Application Development”, Wiley India, (Wrox), 2012.
2. O'Reilly Dawn Griffiths, David Griffiths “Head First Android Development”, O'Reilly Media, Inc., 2015.

3. Dieter Meiller, “Modern App Development with Dart and Flutter 2”, Walter de Gruyter GmbH, Berlin/Boston, 2021.

Suggested Reading:

1. Wei-Meng Lee, “Beginning Android 4 Application Development”, Wiley India (Wrox), 2013.
2. David Wolber, Hal Abelson, Ellen Spertus & Liz Looney, “App Inventor-Create your own Android Apps”, O’Reilly, 2011.

Online Resources:

1. https://developer.android.com/studio?gclid=Cj0KCQjwyN-DBhCDARIsAFOELTkESs57QOqIUktCOBZKgk8NkVT5OhpCnxUx4V6yDMPt6c-Ot7j4-sEaAiasEALw_wcB&gclsrc=aw.ds
2. https://onlinecourses.nptel.ac.in/noc20_cs52/preview
3. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

20CSE37

HIGH PERFORMANCE COMPUTING
(Professional Elective – II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Computer architecture and microprocessor, Operating systems, Data Structures, Programming for problem solving, OOPs, Design and analysis of algorithms.

Course Objectives: The objectives of this course are,

1. To become good at parallel computing algorithm design.
2. To learn modeling and problem solving using different types of parallel computing architectures.
3. To measure the performance of parallel algorithms and arrive at reasonable estimates of cost tradeoffs.
4. To learn various paradigms in algorithm design for computationally intensive applications.
5. To understand the use of modern multi-processor and multi-core architectures.

Course Outcomes: On successful completion of the course, students will be able to,

1. Understand different parallel computing architectures and networks.
2. Ability to design parallel algorithms and measure their performance.
3. Understand vector processing, memory bottlenecks, data and thread-level parallelism.
4. Understand the various programming frameworks like MPI, OpenMP and CUDA.
5. Understand cache coherence protocols and read-write semantics of parallel programs.
6. Gain knowledge of writing efficient parallel programs.

UNIT - I

Modern Processors: Stored-Program Computer Architecture, General-Purpose cache-based Microprocessor Architecture, Memory Hierarchies, Multicore processors, Multithreaded processors, Vector processors.
Basic optimization techniques for serial code: Scalar profiling, Common sense optimizations, Simple measures, large impact, the role of compilers, Data access optimization.

UNIT - II

Parallel computers: Taxonomy of parallel computing paradigms, Shared-memory computers, Distributed-memory computers, Hierarchical (hybrid) systems, Networks.
Basics of parallelization: Why parallelize? Parallelism, Parallel scalability.

UNIT - III

Shared-memory parallel programming with OpenMP: Introduction to OpenMP, Profiling OpenMP programs, Performance pitfalls, Case study: OpenMP-parallel Jacobi algorithm.

UNIT - IV

Distributed-memory parallel programming with MPI: Message passing, Introduction to MPI, MPI performance tools, Communication parameters, Synchronization, serialization, contention, Reducing communication overhead, Case study: Parallel sparse matrix-vector multiply.

UNIT - V

CUDA: Understanding the CUDA computing model and the API using nvcc compiler, Introduction to modern super computing architectures featuring NVIDIA processors.

Text Books:

1. Georg Hager, Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall / CRC Computational Science series, 2011.
2. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, "Introduction to Parallel Computing", Second Edition, Addison-Wesley, 2003.
3. Shane Cook, Morgan "CUDA Programming a Developer's Guide to Parallel Computing with GPUs" Kaufman Publishers.

Suggested Reading:

1. Michaek J. Quinn, “Parallel Computing: Theory and Practice”, Second Edition, Tata McGraw-Hill Edition.
2. V. Rajaraman, C. Siva Ram Murthy, “Parallel Computers: Architectures and Programming”, PHI.
3. Michael Quinn, “Parallel Programming in C with MPI and OpenMP”, McGraw-Hill Publisher.
4. John Hennessey and David Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufman Publishers.

Online Resources:

1. https://www.educative.io/courses/learn-to-use-hpc-systems-and-supercomputers

20ECO01

REMOTE SENSING AND GIS
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of Geography is required.

Course Objectives:

1. Explain the fundamental concepts of remote sensing and digital imaging techniques.
2. Make the students to understand the principles of thermal and microwave remote sensing.
3. Make the students understand the significance of GIS and the process of GIS.

Course Outcomes:

1. Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions.
2. Choose an appropriate technique for a given scenario by appreciating the types of remote sensing.
3. Distinguish the principle behind the working of microwave and LiDAR sensing.
4. Apply Microwave remote sensing techniques.
5. Explain the procedure for encoding data and geospatial data analysis.

UNIT - I

Concept of Remote Sensing: Remote sensing definition, data, process, EM bands used in remote sensing, Interactions and recording of energy: interaction with atmosphere, interaction with earth surface features (soil, water, vegetation), recording of energy by sensors, Transmission, reception and processing, Image interpretation and analysis, Applications, Advantages and limitations of Remote sensing, Orbits of Remote sensing satellites, Indian remote sensing satellites.

UNIT - II

Digital Imaging: Types of Remote sensing, Sensor resolutions, Digital Image, Sensor components, Principle of a long-track and across-track scanning, Hyperspectral Imaging, Thermal Remote Sensing.

UNIT - III

Microwave Remote Sensing: Active and Passive Microwave Remote Sensing, Radar Imaging: Key components of imaging radar, viewing geometry, spatial resolution, principle of RAR, SAR and their range resolution, Satellite Radar Imaging, LIDAR.

UNIT - IV

Concept of Geographic Information Systems: Key components of GIS, joining spatial and attribute data, functions, advantages and applications of GIS, Spatial data model, Raster data model, Vector data model.

UNIT - V

Process of GIS and Geospatial analysis: Data sources, encoding raster data, encoding vector data, encoding attribute data, linking spatial and attribute data, Geospatial data analysis methods database query, geospatial measurement, overlay operations, network analysis and surface analysis. Integration of GIS and remote sensing.

Text Books:

1. Basudeb Bhatta, “Remote Sensing and GIS”, 2/e, Oxford University Press, 2012.
2. Lillesand T.M., and Kiefer R.W. “Remote Sensing and Image Interpretation”, 6/e, John Wiley &Sons, 2000.

Suggested Reading:

1. James B. Campbell and Randolph H. Wynne, “Introduction to Remote Sensing”, the Guilford Press, 2011.
2. Michael N DeMers, “Fundamentals of GIS”, 2/e, John Wiley, 2008.

20MTO01

FINANCIAL MATHEMATICS
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. To explain the terms of financial market and its derivatives including options and futures.
2. To explain the modern portfolio theory.
3. To discuss the pricing theory in discrete time.
4. To explain the stochastic calculus.
5. To discuss the pricing theory in continuous theory.

Course Outcomes: On Successful completion of the course, students will be able to

1. Calculate the internal rate of return, annuity and amortization.
2. Apply the portfolio theory.
3. Examine the binomial model of pricing.
4. Analyze the stochastic differential equations.
5. Solve the BSM partial differential equations.

UNIT - I

Introduction to financial markets: Introduction to financial markets, financial instruments, bonds, stocks, futures & forwards, swaps and options. Time value of money, simple and compound interest rate, net present value, annuities, Amortization, Bond yield, internal rate of return and annuities. Markowitz portfolio theory, risk and return, two and multi-asset portfolio theory, minimum variance portfolio, efficient frontier.

UNIT - II

Modern portfolio theory: Capital Asset Pricing Model and portfolio performance analysis. No arbitrage principle, pricing of forwards and futures, properties of options. Derivative pricing by replication in single and multi-period binomial model.

UNIT - III

Risk neutral pricing in discrete time: Discrete probability spaces, filtration, conditional expectation. Discrete time martingales, Markov chain, risk-neutral pricing in binomial model for European and American derivatives.

UNIT - IV

Stochastic Calculus: General probability spaces, conditional expectation, Brownian motion and its properties. Ito integral, Ito formula, Girsanov's theorem, martingale representation theorem, stochastic differential equation.

UNIT - V

Risk neutral pricing in continuous time:-Black Scholes-Merton (BSM) model, pricing of European derivatives in BSM framework. Valuation of European options in BSM model, BSM formula, BSM partial differential equation, hedging, model completeness, and fundamental theorems of asset pricing.

Text Books:

1. Ales Cerny "Mathematical Techniques in Finance: Tools for Incomplete Markets". Princeton University Press, 2009.
2. Luenberger, David G. "Investment Science", Oxford University Press. Delhi, 1998.

Suggested Reading:

1. Hull, J. C., &Basu, S. "Options, Futures and Other Derivatives" 7th Edition Pearson Education. New Delhi, 2010.
2. S. R. Pliska "Introduction to Mathematical Finance: Discrete Time Models". Blackwell Publishers Inc., 2002.
3. Ross, Sheldon M. "An elementary Introduction to Mathematical Finance" 3rd Edition, Cambridge University Press. USA, 2011.

20EEO02

ENERGY MANAGEMENT SYSTEMS
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Students should have prior knowledge on different energy generation systems, basic idea about audit instruments.

Course Objectives: The objectives of this course are,

1. To know the concept of Energy Management.
2. To understand the formulation of efficiency for various Engineering Systems.
3. To enable the students to develop managerial skills to assess feasibility of alternative approachesand drive strategies regarding Energy Management.

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

1. Know the current Energy Scenario and importance of Energy Conservation.
2. Understand the concepts of Energy Management, Energy Auditing.
3. Interpret the Energy Management methodology, Energy security and Energy Strategy.
4. Identify the importance of Energy Efficiency for Engineers and explore the methods of improving Energy Efficiency in mechanical systems, Electrical Engineering systems.
5. Illustrate the Energy Efficient Technologies in Civil and Chemical engineering systems.

UNIT - I

Various form of Energy and its features: Electricity generation methods using different energy sources such as solar energy, wind energy, Bio-mass energy, and Chemical energy such as fuel cells. Energy Scenario in India, Impact of Energy on economy, development, and environment sectors of national and international perspective.

UNIT - II

Energy Management-I: Defining Energy Management, need for Energy Management, Energy management techniques, importance of Energy Management, managing the Energy consumption, Energy Audit and Types, Energy Audit Instruments.

UNIT - III

Energy Management-II: understanding Energy costs, bench marking, Energy performance, matching energy use to requirement, optimizing the input, fuel & Energy substitution, material and Energy balance diagrams, Energy pricing, Energy and Environment, Energy Security.

UNIT - IV

Energy Efficient Technologies-I: Importance of Energy Efficiency for Engineers, Energy Efficient Technology in Mechanical engineering: Compressed Air System, Heating, ventilation and air- conditioning, Fans and blowers, Pumps and Pumping Systems.

Energy Efficient Technology in Electrical engineering: Automatic Power Factor Controllers, Energy Efficient Motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, space cooling, energy efficiency of lifts and escalator, energy saving potential of each technology.

UNIT - V

Energy Efficient Technologies-II: Energy Efficient Technology in Civil Engineering: Intelligent Buildings, And Various Energy Efficiency Rating Systems for Buildings, Green Buildings Energy Efficiency: management of green buildings, importance of embodied energy in selection of sustainable materials, green building design, waste reduction/recycling, rainwater harvesting, maintenance of the green buildings, green building certification, Renewable energy applications.

Energy Efficient Technology in Chemical Engineering: Green chemistry, Low carbon cements, recycling paper.

Text Books:

1. Umesh Rathore, 'Energy Management', Kataria publications, 2nd ediiton, 2014.
2. G Hariharaiyer, “Green Building Fundamentals”, Notion press.com.
3. K V Shama, P Venkataseshaiah, "Energy management and conservation", I. K. International Publishing agency pvt. ltd., 2011.

Suggested Reading:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects.
2. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014) An Overview of Energy Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering, The University of Adelaide and Queensland University of Technology.
3. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org).

20EGO01

TECHNICAL WRITING SKILLS
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. Process of communication and channels of communication in general writing and technical writing in particular.
2. Learn Technical Writing including sentence structure and be able to understand and use technology specific words.
3. Write business letters and technical articles.
4. Write technical reports and technical proposals.
5. Learn to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.

Course Outcomes: On Successful completion of the course, students will be able to

1. Communicate effectively, without barriers and understand aspects of technical communication.
2. Differentiate between general writing and technical writing and write error free sentences using technology specific words.
3. Apply techniques of writing in business correspondence and in writing articles.
4. Draft technical reports and technical proposals.
5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.

UNIT - I

Communication – Nature and process.
Channels of Communication – Downward, upward and horizontal communication. Barriers to communication.
Technical Communication – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

UNIT - II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

UNIT - III

Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.
Technical Articles: Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

UNIT - IV

Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports.
Technical Proposals: Definition, types, characteristics, structure and significance.

UNIT - V

Mechanics of Meetings: Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences.
Technical Presentations : Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, “Technical Communications-Principles and Practice”, Oxford University Press, Second Edition, 2012.
2. M Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, “Basic Technical Communication”, PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGraw Hill, 2003.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

20CEO02

DISASTER RISK REDUCTION AND MANAGEMENT
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the concepts of hazards, causes and impacts of disasters.
2. Develop a critical capacity to evaluate the principles and practices of disaster risk reduction and management.
3. Develop a deep awareness of disaster resilience, risk mitigation, and recovery policies as they arise from natural hazards around the globe.
4. Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction.
5. Evaluate DM study including data search, analysis and presentation as a case study.

UNIT - I

- Hazard and disaster-concepts, vulnerability and risk.
- Hazard and disaster type – Natural, Water- related, pandemic and Human induced hazards disasters.
- Causes and Impacts of disasters – Impacts on natural eco systems: physical, psychological and social impact.
- Disaster and financial resilience.
- GIS and remote sensing.
- Disaster vulnerability profile of India –Specific to geographical regions and states (as per regional significance).

UNIT - II

- Disaster Management Cycle –Rescue, Relief, Rehabilitation, Prevention, Mitigation and Preparedness.
- Disaster risk reduction {DRR) –Community based DRR, institutions concerned with safety, disaster mitigation and construction techniques as per Indian standards.
- Early warning systems.

UNIT - II

- Trauma and stress management.
- First aid and emergency procedures.
- Awareness generation strategies for the community on safe practises in disaster (as per regional significance).

UNIT - II

- Components of disaster management –preparedness of rescue and relief, mitigation, rehabilitation &reconstruction.
- Institutional frame work of disaster management in India (NDMA-SDMA, NDRF, Civic volunteers, NIDM).
- Phases of disaster/risk management and post-disaster responses.
- Compensation and insurance.
- Applications of remote sensing and GIS in disaster management.

UNIT - V

- Capacity building for disaster/damage mitigation (structural and non-structural measures).
- Disaster risk reduction strategies and national disaster management guidelines.
- Disaster management Act -2005.
- Regional issues as per regional requirement/university can take minimum two topics as per high powered committee.

Text Books:

1. Singh, R. (2017), “Disaster management Guidelines for Earth quakes, Landslides, Avalanches and Tsunami”. Horizon Press publications.
2. Taimpo (2016), “Disaster management and preparedness”. CRC Press Publications.
3. Nidhi, G.D. (2014), “Disaster management preparedness” .CBS Publications Pvt. Ltd.
4. Gupta, A.K.,Nair, S.S., Shiraz, A. and Dey, S. (2013), “Flood Disaster Risk Management-CBS Publications Pvt Ltd.
5. Singh, R. (2016), “Disaster management Guidelines for Natural Disasters” Oxford University Press Pvt. Ltd.

20CHO04

ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT
(Open Elective - II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: This course will help the students:

1. To have an increased awareness on issues in areas of sustainability.
2. To understand the role of engineering & technology within sustainable development.
3. To know the methods, tools and incentives for sustainable product service system development.
4. To establish a clear understanding of the role and impact of various aspects of engineering decisions on environmental, societal and economic problems.
5. To communicate results related to their research on sustainable engineering.

Course Outcomes: At the completion of this course students will be able:

1. To relate sustainability concepts and ethical principles towards environment.
2. To understand the different types of environmental pollution problems and their respect sustainable solutions.
3. To become aware of concepts, analytical methods/models, and resources for evaluating and comparing sustainability implications of engineering activities.
4. To critically evaluate existing and new methods.
5. To develop sustainable engineering solutions by applying methods and tools to research a specific system design.
6. To apply concepts of sustainable development to address sustainability challenges in a global context.

UNIT- I

Introduction of sustainability- Need and concept of Sustainable Engineering, Social-environmental and economic sustainability concepts, Sustainable development and challenges, Multilateral Environmental acts and protocols-Clean Development Mechanism (CDM), Environmental legislations in India- Air Act and Water Act.

UNIT- II

Economic and social factors affecting sustainability, Effects of pollution from natural sources, Solid waste-sources, impacts, 4R (Reduce, Reuse, Recycling, Recover) concept, Global environmental issues-Resource degradation, Climate change, Global warming, Ozone layer depletion, Tools used to ensure sustainability in engineering activities such as environmental management systems and environmental impact assessment studies.

UNIT- III

Global, Regional and Local environmental issues, Carbon credits and Carbon trading, Carbon foot print, Environmental management standards, ISO 14000 series, Life cycle Analysis (LCA)-scope and goal, Procedures of EIA (Environment Impact Assessment) in India-Procedures of EIA in India.

UNIT- IV

Basic concept of sustainable habitat-Sustainable cities, Sustainable transport, Sustainable sources of energy-conventional and renewable sources, Green Engineering: Green buildings, Green materials for sustainable design, Green building certification, Methods for increasing energy efficiencies of buildings.

UNIT- V

Technology and sustainable development, Sustainable urbanization, Industrialization and poverty reduction, Social and Technological change, Industrial processes-material selection, Pollution prevention, Industrial ecology, Industrial symbiosis.

Text Books:

1. Allen D. T and ShonnardD. R., Sustainability Engineering Concepts, Design and Case Studies, 1st Ed, Prentice Hall, 2011.
2. Bradley A. S, Adebayo A. O and Maria. P., Engineering Applications in Sustainable Design and Development, 1st Ed, Cengage Learning, 2016.

Suggested Reading:

1. Rag R. L., Introduction To Sustainable Engineering, 2nd Ed, PHI Learning Pvt Ltd, 2016.
2. Krishna R. Reddy, Claudio Cameselle, Jeffrey A. Adams., Sustainable Engineering,1st Ed, Wiley, 2019.

20EGMO3

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Introduction

This course discusses the role of human values in one's family, in society and in nature. In the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives: The objectives of this course are,

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes: On Successful completion of the course, students will be able to

1. Students are expected to become more aware of themselves and their surroundings (family, society, nature).
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT - I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal HumanValues-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario.
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II

Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material'Body'.
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.

UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- Understanding the meaning of Trust; Difference between intention and competence.

- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals.
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT – IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature.
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all - pervasivespace
- Holistic perception of harmony at all levels of existence.

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values.
- Definitiveness of Ethical Human Conduct.
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.
- Strategy for transition from the present state to Universal Human Order:
    - At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
    - At the level of society: as mutually enriching institutions and organizations.

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by faculty mentor: 10 marks
Self-assessment/Assessment by peers: 10 M
Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 60 marks
The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

The Teacher’s Manual:

1. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Suggested Reading:

1. A Nagaraj Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
3. Cecile Andrews, Slow is Beautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, “Rediscovering India”
6. E. FSchumacher. “Small is Beautiful”
7. J. C. Kumarappa “Economy of Permanence”
8. Pandit Sunderlal “Bharat Mein Angreji Raj”

9. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth”
10. 10.Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
11. Maulana Abdul Kalam Azad, India Wins Freedom.
12. Vivekananda - Romain Rolland (English)
13. The Story of Stuff (Book)

20CSC25

CASE STUDIES USING UML LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Object Oriented Programming, Software Engineering.

Course Objectives: The objectives of this course are,

1. To identify Project Scope, Objectives and infrastructure.
2. To understand Software Engineering methodologies for project development.
3. To gain knowledge about Computer Aided Software Engineering (CASE) tools.
4. To use effective communication and technical skills for building quality software.

Course Outcomes: On Successful completion of the course, students will be able to,

1. Identify the problem scope and constraints in the problem.
2. Prepare software requirements specifications (SRS) for the system according to standards.
3. Apply the design notations of structured approach to develop ER and Data Flow Diagrams.
4. Apply/Use the design notations of OO approach to develop UML diagrams using rational tools.
5. Implement, analyze and prepare the documentation for the proposed system.

Select one large Information System/Approach and device the following using UML tool:

1. Structured Diagrams (Data Flow Diagrams, Entity-Relationship Diagrams etc.).
2. Preparation of Software Requirement Specification Document for a given Case Study.

UML Diagrams

1. Use Case Diagrams.
2. Class Diagrams.
3. Sequence Diagrams.
4. Activity Diagrams.
5. State Chart Diagrams.
6. Component Diagrams.
7. Deployment Diagrams.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: “The Unified Modeling Language User Guide”, Pearson Education, 2007.
2. Roger S. Pressman, “Software Engineering - A Practitioners Approach”, 7th Edition, Pearson Education, India, 2010.

20CIC09

BLOCKCHAIN PLATFORMS AND APPLICATIONS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Distributed Systems, Computer Networks.

Course Objectives: The objectives of this course are to

1. Introduce the fundamental design and architectural primitives of Blockchain and consensus Protocols.
2. Explore various blockchain platforms.
3. Understand and develop smart contracts and decentralized applications.
4. Understand the significance of Hyperledger Fabric and composer.
5. Apply blockchain securely in various sectors ranging from Financial to Government.

Course Outcomes: On successful completion of the course, students will be able to

1. Understand the fundamental design and architectural primitives of Blockchain and consensus Protocols.
2. Deploy various blockchain platforms and identify the significance of smart contracts.
3. Implement the working of Ethereum and decentralized applications.
4. Implement the blockchain applications with Hyperledger Fabric and Composer.
5. Apply blockchain in different application domains such as financial and supply chain sectors.
6. Analyze the Implications of blockchain for privacy and security.

LIST OF EXPERIMENTS:

1. Understanding Blockchain Foundations: Elements of Distributed Computing, Elements of Cryptography, digital signature.
2. Introduction to Solidity Programming with basic syntax's.
3. Getting Familiar with Development environments like: MIX (The DApp IDE), Ether.camp and Truffle etc.
4. Working with tools like Remix, Ganache, MetaMask etc to build and deploy the smart contracts.
5. Setup a MetaMask Ethereum wallet in the web browser to create wallets (User Accounts) and use it to send and receive Ethers.
6. Create a genesis block to set up the private blockchain network using Go Ethereum (Geth) and Mist, start mining with miner.start() command.
7. Use EtherScan to view the transaction details, explore Blockchain test networks to perform transactions, execute smart contracts.
8. Creating and deploying the simple smart contracts like “Hello World”, incrementing/decrementing the counter variable on the Blockchain network.
9. Launch Dapps using Ethereum.
10. Hyperledger Fabric Demo.
11. Building DApps Using Hyperledger fabric.
12. Deploy any real world applications in various sectors such as Financial, Digital identity, Education, Healthcare, Agriculture, Land registrations etc.on a suitable Blockchain platform.

Text Books:

1. Bettina Warburg, Bill Wanger and Tom Serres, Basics of Blockchain (1 ed.), Independently published, 2019. ISBN 978-1089919445.
2. Reed, Jeff, Smart contracts: The essential guide to using blockchain smart contracts for cryptocurrency exchange (1 ed.), CreateSpace Independent Publishing Platform, 2016. ISBN 978-1539457442.

Suggested Reading:

1. Diedrich Henning, Ethereum: blockchains, digital assets, smart contracts, decentralized autonomous organizations (1 ed.), Wildfire Publishing, 2016. ISBN 978- 1523930470.
2. Antonopoulos and Andreas M., Mastering Bitcoin: unlocking digital cryptocurrencies (1 ed.), O'Reilly Media, Inc., 2015. ISBN 978-1449374044.

Online Resources:

1. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials
2. Ethereum Development Resources - https://ethereum.org/en/developers

20CIE06

SENSORS AND SENSING TECHNOLOGIES LAB
(Professional Elective-II Lab)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: IoT development, applications and practice.

Course Objectives: The objectives of this course are to

1. Identify various types of sensors used in IoT.
2. Illustrate connection of sensors to processing devices.
3. Understand various communication protocols used for IoT sensing.

Course Outcomes: On successful completion of the course, students will be able to

1. Strong understanding of fundamentals of Sensing and Sensor Devices.
2. Illustrate the mechanism to connect the sensors to processing devices.
3. Demonstrate the communication mechanism for IoT sensors.
4. Design and implement data processing software to utilise sensor data.
5. Develop virtual instruments for specific application using LabVIEW software.
6. Ease the programming required to make computer interact with real world.

LIST OF EXPERIMENTS:

1. To study the digital response of IR motion sensor and to determine its range.
2. Experiment with force/stress sensor.
3. Perform experiment using magnetic sensor.
4. Perform experiment using electrochemical sensor.
5. To deploy LIFA (LabVIEW interface for Arduino) and to study the response using LabVIEW and Arduino.
6. To draw the input -output characteristics of a LVDT and to determine its sensitivity using LabVIEW.
7. To draw the temp- voltage graph for a LM 35 temperature module and to determine its sensitivity using LabVIEW.
8. To observe temperature characteristics from LabVIEW.
9. Study of resistive soil moisture sensor and to observe its characteristic graph using LabVIEW.
10. Implement different case studies using advanced sensors and processing devices.

Text Books:

1. Intelligent Sensing, Instrumentation and Measurements- Mukhopadhyay, Subhas Chandra.
2. Virtual instrumentation using LabView – Jovitha Jerome, PHI, 2011.
3. Arduino programming-Mark Torvalas.

Suggested Reading:

1. Patranabis D, “Sensors and Transducers,” Prentice Hall 2013 , second edition.
2. Frank R, “Understanding Smart Sensors”, Artech House.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.
4. Callaway EH, “Wireless Sensor Networks : Architecture and Protocols,” Auerbach Publications.
5. Anand MMS, “Electronic Instruments and Instrumentation Techniques,” Prentice Hall.
6. IEEE Standard 1451, “Smart Transducer Interface for Sensor and Actuators”.

Online Resources:

1. https://www.arrow.com/en/research-and-events/articles/sensor-technologies?
   yokogawa.com/special/sensing-technology
2. https://onlinecourses.nptel.ac.in/noc21_ee32/preview

20CIE07

VULNERABILITY ANALYSIS AND PENETRATION TESTING LAB
(Professional Elective-II Lab)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Operating System, Computer Networks.

Course Objectives: The objectives of this course are to

1. Test, run exploits to identify vulnerabilities in networks.
2. Identify and analyse exposures and weaknesses in applications.
3. Perform Penetration Testing and make reports based on test results.

Course Outcomes: On Successful completion of the course, students will be able to

1. Install and exploit tools for network protection.
2. Exploit and analyse vulnerabilities in LAN, wireless devices and identify the same using penetration testing.
3. Perform vulnerability scanning and penetration testing using appropriate tools and techniques.
4. Perform a wireless pen testing, packet analysis and log analysis.
5. Perform static and dynamic analysis on application.

LIST OF EXPERIMENTS:

1. To install and exploit security tools for protecting a network.
2. To exploit the vulnerabilities in a LAN environment and launch attacks.
3. To analyse the network packet using Wireshark.
4. To perform the web penetration testing using Burp suite.
5. To perform vulnerability assessment of wireless devices.
6. To exploit vulnerabilities in the systems using Metasploit.
7. To perform the log analysis using Splunk.
8. To find vulnerable application in play store and perform static and dynamic analysis on it.

Text Books:

1. Ethical Hacking: A Hands-on Introduction to Breaking In by Daniel G. Graham, October 2021, 376 pp. ISBN-13: 9781718501874 No Starch Press.

Suggested Reading:

1. Practical Binary Analysis Build Your Own Linux Tools for Binary Instrumentation, Analysis, and Disassembly by Dennis Andriesse December 2018, 456 pp. ISBN-13:9781593279127. No Starch Press.
2. Designing Secure Software, A Guide for Developers by Loren Kohnfelder November 2021, 312 pp. ISBN-13: 9781718501928 No Starch Press.
3. Penetration Testing: Hands-on Introduction to Hacking by Georgia Weidman, 1st Edition, No Starch Press.
4. The Pen Tester Blueprint-Starting a Career as an Ethical Hacker by L. Wylie, Kim Crawly, 1st Edition, Wiley Publications.

20CSE15

SOFT COMPUTING LAB
(Professional Elective-II Lab)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Linear Algebra & Calculus, Differential Equations & Transform Theory.

Course Objectives: The objectives of this course are,

1. To illustrate the concepts of simple neuron.
2. To learn the fundamentals of Neural Networks & Feed Forward Networks, Associative Memories & Artificial Neural Networks.
3. To understanding the concepts of Fuzzy Logic and Fuzzy Systems, Genetic Algorithms and its design.

Course Outcomes: On Successful completion of the course, students will be able to,

1. Implement McCulloh-Pitts model for Boolean operations.
2. Apply perceptron learning algorithm for a given problem.
3. Design and analyze various Neural Networks Architectures.
4. Apply concepts of fuzzy sets on real-time applications.
5. Implement Genetic Algorithms with its operators.
6. Apply soft computing strategies for various real time applications

LIST OF EXPERIMENTS:

1. Implementation of Simple Neural Network (McCulloh-Pitts model) for realizing AND Operation and OR operation.
2. Implementation of Perceptron network for realizing NAND operation.
3. Implementation of ANDNOT using ADALINE network.
4. Implementation of XOR problem using MADALINE network.
5. Design and Develop the Back Propagation Algorithm.
6. Implementation of Bidirectional Associative Memory (BAM) network.
7. Implementation of Hopfield Network.
8. Implementation of Membership Functions in Fuzzy Sets.
9. Implementation of Kohonen Self-Organizing Feature Maps (KSOFM) network for Clustering.
10. Implement the Genetic Algorithm for the function $f(x) = x^2$

Text Books:

1. S.N. Sivanandam & S.N. Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2011.

Suggested Reading:

1. D.K Prathikar, “Soft Computing”, Narosa Publishing House, New Delhi, 2008.
2. S.N.Sivanandam, S.N.Deepa “Principles of Soft Computing” Second Edition, Wiley Publication 2016.
3. Satish Kumar, "Neural Networks -A classroom approach"; Second Edition, TMH, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

20CSE32

MOBILE APPLICATION DEVELOPMENT LAB
(Professional Elective-II Lab)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To learn how to develop Applications for android environments.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Course Outcomes: On Successful completion of the course, students will be able to,

1. Analyze all the components and their properties of various Emulators for selecting suitable emulator.
2. Apply essential Android programming concepts for developing efficient mobile app.
3. Develop Android applications related to various layouts.
4. Design Flutter applications with rich user interactive interfaces.
5. Develop Android applications related to mobile related server-less database like SQLite.
6. Extend event handling to develop various mobile applications.

LIST OF EXPERIMENTS:

1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password and Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an application for Alarm clock with Snooze ability, i.e., if user don't off the alarm when it rings, then alarm should repeat for every 10 minutes until user turns it off.
10. Create an App to demonstrate ActionBar for application navigation.
11. Create Flutter and iOS Apps using Dart language for UI Building, Basic widget exploration, Material components exploration, Widgets catalog exploration.
12. Flutter and iOS apps for Adding interactivity, Routing and navigation, Read and write with Dart IO: Setup, Read and write with Dart IO: Final code.

Text Books:

1. David Wolber, Hal Abelson, Ellen Spertus & Liz Looney, “App Inventor-Create your own Android Apps”, O’Reilly, 2011.
2. Dieter Meiller, “Modern App Development with Dart and Flutter 2”, Walter de Gruyter GmbH, Berlin/Boston, 2021.

Tools:

1. Android Studio 4.1.3

Online Resources:

1. https://developer.android.com/studio?gclid=Cj0KCQjwyN-DBhCDARIsAFOELTkESs57QOqIUktCOBZKgk8NkVT5OhpCnxUx4V6yDMPt6c-Ot7j4-sEaAiasEALw_wcB&gclsrc=aw.ds
2. https://onlinecourses.nptel.ac.in/noc20_cs52/preview
3. https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

20CSE40

HIGH PERFORMANCE COMPUTING LAB
(Professional Elective-II Lab)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are to

1. Provide an overview of existing High-Performance Computing (HPC) software and hardware.
2. Expose students to a parallel computing environment.
3. Explore the APIs in MPI programming.
4. Introduce CUDA for parallel computing on GPUs.

Course Outcomes: On Successful completion of the course, students will be able to,

1. Apply System Commands and Networking commands of Linux.
2. Describe OpenMP constructs and functions.
3. Design and implement parallel programs using OpenMP.
4. Apply the APIs in MPI programming.
5. Design and implement parallel programs using CUDA.

LIST OF EXPERIMENTS:

1. Practice Basic commands, System Commands and Networking commands of Linux.
2. Explore basic OpenMP constructs and functions.
3. Design and implement a parallel program using OpenMP to implement the following algorithms and compare the performance with respective sequential algorithm.
    a. Gaussian Elimination Algorithm
    b. Jacobi Algorithm
4. Explore the APIs in MPI programming.
5. Design and implement a parallel program to calculate pi using MPI programming
6. Design and implement a parallel program using MPI to [utilize all the available resources]
    a. add two large vectors
    b. multiply a matrix - vector multiplication [column-wise and row-wise]
7. Explore the details of how to launch CUDA kernel, how to compile and how to use CUDA.
8. Design and implement a parallel program using CUDA to add 2D vectors.

Text Books:

1. Thomas Sterling, Matthew Anderson, and Maciej Brodowic, High-Performance Computing Modern Systems and Practices, Morgan Kaufmann; First edition, 2017.
2. Ruud van der Pas, Eric Stotzer, and Christian Terboven, Using OpenMP - The Next Step, MIT Press 2017.
3. William Gropp, Ewing Lusk, and Anthony Skjellum, Using MPI: Portable Parallel Programming with the Message-Passing Interface MIT Press, 3rd edition, 2015.
4. William Gropp, Torsten Hoefler, and Rajeev Thakur, Using Advanced MPI: Modern Features of the Message- Passing Interface MIT Press, 1st edition, 2015.
5. Duane Storti and Mete Yurtoglu, CUDA for Engineers: An Introduction to High-Performance Parallel Computing, Addison-Wesley 1st edition, 2015.

Online Resources:

1. https://www.oreilly.com/library/view/cuda-for-engineers/9780134177540/?ar
2. https://researchcomputing.princeton.edu/education/external-online-resources/hpc-overview

20EGCO3

EMPLOYABILITY SKILLS

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are,

1. Learn the art of communication, participate in group discussions and case studies with confidence and to make effective presentations.
2. With- resume packaging, preparing them to face interviews.
3. Build an impressive personality through effective time management, leadership qualities, self-confidence and assertiveness.
4. Understand professional etiquette and to make them learn academic ethics and value system.
5. To be competent in verbal aptitude.

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

1. Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals, learn to manage time effectively and deal with stress.
4. Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics.
5. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.

UNIT - I

Verbal Aptitude: Error Detection, Articles, Prepositions, Tenses, Concord and Transformation of Sentences- Jumbled Words/Sentences- Vocabulary, Synonyms, Antonyms, One Word Substitutes, Idioms and Phrases, Word/Sentence/Text Completion- Reading Comprehension.

UNIT - II

Group Discussion & Presentation Skills: Dynamics of Group Discussion-Case Studies- Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Accuracy, Coherence. Elements of Effective Presentation – Structure of a Presentation – Presentation tools – Body language - Preparing an Effective PPT.

UNIT - III

Behavioural Skills: Personal strength analysis-Effective Time Management- Goal Setting- Stress management- **Corporate Culture** – Grooming and etiquette-Statement of Purpose (SOP).

UNIT - IV

Mini Project: Research-Hypothesis-Developing a Questionnaire-Data Collection-Analysis-General and Technical Report - Writing an Abstract –Technical Report Writing-Plagiarism-Project Seminar.

UNIT -V

Interview Skills: Cover Letter and Résumé writing – Structure and Presentation, Planning, Defining the Career Objective and projecting ones Strengths and Skill-sets – Interviews: Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Mock Interviews.

Suggested Reading:

1. Leena Sen, “Communication Skills”, Prentice-Hall of India, 2005.
2. Dr. Shalini Verma, “Body Language - Your Success Mantra”, S Chand, 2006.
3. Edgar Thorpe and ShowickThorpe, “Objective English”, 2nd edition, Pearson Education, 2007.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh, “The ACE of Soft Skills”, New Delhi: Pearson, 2010.
5. Gulati and Sarvesh, “Corporate Soft Skills”, New Delhi: Rupa and Co., 2006.
6. Van Emden, Joan, and Lucinda Becker, “Presentation Skills for Students”, New York: Palgrave Macmillan, 2004.
7. A Modern Approach to Verbal & Non-Verbal Reasoning by R S Aggarwal, 2018.
8. Covey and Stephen R, “The Habits of Highly Effective People”, New York: Free Press, 1989.