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
VII - VIII SEMESTERS

of
FOUR YEAR DEGREE COURSE

in
BE-COMPUTER SCIENCE AND ENGINEERING

(AICTE Model Curriculum with effect from AY 2023-24)

R-20 Regulation

CHAITANYABHARATHIINSTITUTEOFTECHNOLOGY

(An Autonomous Institution)

Affiliated to Osmania U niversity

Kokapet Village, Gandipet Mandal, Hyderabad–500075.Telangana

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTIONS AND EXAMINATION

Model Curriculum(R-20)

B.E. (Computer Science and Engineering)

SEMESTER - VII

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.	20CSC30	Cryptography and Network Security	3	-	-	3	40	60	3
2.	20CSEXX	Professional Elective-IV	3	-	-	3	40	60	3
3.	20CSEXX	Professional Elective-V	3	-	-	3	40	60	3
4.	20XXXXX	Open Elective-III	3	-	-	3	40	60	3
5.	20EGM01	Indian Constitution and Fundamental Principles Principles	2	-	-	2	-	50	-
PRACTICAL									
6.	20CSC31	Cryptography and Network Security Lab	-	-	2	3	50	50	1
7.	20CSEXX	Professional Elective-IV Lab	-	-	2	3	50	50	1
8.	20CSC32	Technical Seminar	-	-	2	-	50	-	1
9.	20CSC33	Project Part- 1	-	-	4	-	50	-	2
10.	20CSI03	Internship - III	3 to 4 weeks / 90 Hours			-	50	-	3
		TOTAL	**14**	**-**	**10**	**-**	**410**	**390**	**20**

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Professional Elective – IV	
20CSE21	Deep Learning
20CSE22	Big Data Analytics
20CSE23	Mobile Application Development
20CSE24	Blockchain Technology
20CAE09	Planning and Estimation of Autonomous Systems

Professional Elective – IV Lab	
20CSE30	Deep Learning Lab
20CSE31	Big Data Analytics Lab
20CSE32	Mobile Application Development Lab
20CSE33	Blockchain Technology Lab
20CAE14	Planning and Estimation of Autonomous Systems Lab

Professional Elective – V	
20CSE25	Social Computing
20CSE26	Human Computer Interaction
20CAE10	Computational Neuroscience
20CSE27	Distributed Systems
20CSE28	Software Project Management
20CSE29	Design Patterns

Open Elective-III	
20PYO01	History of Science and Technology
20MEO03	Research Methodologies
20MEO04	Entrepreneurship
20ECO05	Systems Automation and Control
20EEO03	Energy Auditing

20CSC30

CRYPTOGRAPHY AND NETWORK SECURITY

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: Data Communication and computer networks.

Course Objectives: The objectives of this course are,

1. To understand the importance of confidentiality, integrity, availability and authentication.
2. To understand various cryptographic algorithms.
3. To understand categories of threats to computer networks.
4. To describe public-key cryptosystem, key generation and distribution.
5. To understand implementation of Firewalls and web security.

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

1. Analyze and design classical encryption techniques and block ciphers.
2. Analyze and design hash and MAC algorithms, and digital signatures.
3. Design network application security schemes like PGP, S/MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.
4. Evaluate the authentication and hash algorithms.
5. Create and configure simple firewall architectures.
6. Understand digital sign in emails and files.

UNIT - I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512).

Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

UNIT - IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

UNIT - V

E-Mail Security: Pretty Good Privacy, S/MIME.

IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange.

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Ransomware.

Text Books:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

Suggested Reading:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

Online resources

1. https://onlinecourses.nptel.ac.in/noc21_cs16/

20CSE21

DEEP LEARNING
(Professional Elective – IV)

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: Artificial Intelligence, Machine Learning.

Course Objectives: The objectives of this course are,

1. To learn Deep learning techniques and their applications.
2. To acquire the knowledge of neural network architectures, Deep learning methods, models and algorithms.
3. To understand CNN and RNN algorithms and their applications.

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

1. Understand various learning models.
2. Design and develop various Neural Network Architectures.
3. Understand approximate reasoning using Convolution Neural Networks.
4. Analyze and design Deep learning algorithms in different applications.
5. Ability to apply CNN and RNN techniques to solve different applications.
6. Evaluate the Performance of different models of Deep learning networks.

UNIT - I

Introduction: Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, FeedForward Neural Networks, Representation Power of Feedforward Neural Networks, Backpropagation, Historical Trends in Deep Learning.

Optimization: Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.

UNIT - II

Autoencoders: relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, **Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization.

UNIT - III

Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types.

LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks.

UNIT – IV

Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs.

Encoder Decoder Models, Attention Mechanism, Attention over images, Introduction to Transformers.

UNIT – V

Generative Adversarial Networks (GANs): Introduction, Discriminator, Generator, Activation, Common activation functions for GANs, BCE loss, Conditional GANs, Controllable generation, real life GANs.

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., “Deep Learning “, MIT Press, 2016.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Ganguly Kuntal, “Learning generative adversarial networks: next-generation deep learning simplified”, Packt Publishing, 2017.

Suggested Reading:

1. Tom M. Mitchell, "Machine Learning ", MacGraw Hill, 1997.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018.
4. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
5. Rothman, Denis, “Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more”, Packt Publishing Ltd, 2021.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

20CSE22

BIG DATA ANALYTICS
(Professional Elective – IV)

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: Database management systems, Programming for problem solving, OOPs.

Course Objectives: The objectives of this course are,

1. To understand the need of Big Data, challenges and different analytical architectures.
2. To understand Hadoop Architecture and its ecosystems.
3. To understand processing of Big Data with advanced architectures like Spark.

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

1. Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data.
2. Discuss about Hadoop Framework and eco systems.
3. Understand and work on NoSQL environment and MongoDB.
4. Explain and Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark framework.
5. Demonstrate spark programming with Python/R programming languages.
6. Explain and Analyse the data Analytics algorithms in Spark

UNIT - I

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution -Definition of big data-Characteristics and Need of big data-Challenges of big data.

Big data analytics: Overview of business intelligence, Data science and Analytics– Big Data Analytics - Typical Analytical Architecture – Classification of analytics.

UNIT - II

Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system (SQL,RDBMS) - Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2 – HDFS.

MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN.

UNIT – III

Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types- Advantages &Disadvantages -Application of NoSQL. **NewSQL**: Overview of NewSQL - Comparing SQL, NoSQL and NewSQL.

Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT - IV

(Big Data Frame Works for Analytics)

Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-Reduce Side Join-Secondary Sorting-Pipelining MapReduce jobs

Spark Frame Work: Introduction to Apache spark-How spark works, Programming with RDDs: Create RDD-spark Operations-Data Frame.

UNIT - V

(Data Analytics using ML)

Data Analysis with Spark

Data Exploration: Univariate and Multivariate Analysis. **Data Manipulation**: Feature Extraction- Feature Transform-Feature Selection-**Regression:** Linear Regression

Classification: Decision Trees-Naïve Bayes Classification- **Clustering:** K-means

Text Books:

1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.
2. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.

Suggested Reading:

1. TomWhite, "Hadoop: The Definitive Guide", O'Reilly, 4th Edition, 2015.
2. Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015
3. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012

20CSE23

MOBILE APPLICATION DEVELOPMENT
(Professional Elective – IV)

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

20CSE24

BLOCKCHAIN TECHNOLOGY
(Professional Elective – IV)

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: Data Structures, Cryptography and Network Security, Distributed Systems.

Course Objectives: The objectives of this course are,

1. To provide understanding and significance of Blockchain.
2. To familiarize with platforms such as Ethereum, Hyperledger Fabric involved in building Blockchain applications.
3. To impart knowledge about the applications of Blockchain in various sectors.

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

1. Understand the significance of Blockchain technology and its associated components.
2. Understand the need for consensus protocols in Blockchain.
3. Experience the Ethereum and Hyperledger Fabric Platforms.
4. Incorporate Blockchain in financial software Systems and supply chain environments.
5. Devise the need for Blockchain in Government sectors.
6. Understand the significance of blockchain security.

UNIT – I

Introduction: Overview of distributed systems; Introduction to Blockchain; Properties of Blockchain; Evolution of Blockchain, Hash Functions, Merkle Trees; Components of Blockchain Ecosystem; Types of Blockchain; Blockchain Platforms.

UNIT – II

Distributed consensus: Consensus algorithms, Consensus in a Bitcoin network, Proof of Work (PoW), Proof of Stake, Proof of Burn, Proof of Elapsed Time; Consensus models for permissioned block chain, Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, BFT over Asynchronous systems.

UNIT – III

Ethereum: Introduction to Ethereum Smart Contracts; Mining in Ethereum; Consensus mechanism in Ethereum; Technologies that support Ethereum; Ethereum Programming Languages; Hyperledger Fabric: Introduction to Hyperledger Fabric; Hyperledger Fabric architecture; Consensus in Hyperledger Fabric; Hyperledger API and Application Model; Hyperledger Composer tool.

UNIT – IV

Use Case I: Blockchain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance.

Use case II: Blockchain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT – V

Use Case III: Blockchain for Government: Digital identity, land records and other kinds of record keeping between government entities, Blockchain

Cryptography: Privacy and Security on Blockchain.

Text Books:

1. Imran Bashir, “Mastering Blockchain : A deep dive into distributed ledgers, consensus protocols, smart contracts, Dapps, cryptocurrencies, Ethereum, and more”, Packt Publishing,Third Edition, 2020,
2. Mark Gates, “Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates, 2017.

3. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
4. ArshdeepBahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", ArshdeepBahga, Vijay Madisetti publishers 2017.

Suggested Reading:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, Inc., 2014.
2. Melanie Swa, "Blockchain", O'Reilly Media, 2014.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
2. Hyperledger Fabric – https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain – An IBM Redbooks course, by Bob Dill, David Smits, 2017 https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.htm
4. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

20CAE09

PLANNING AND ESTIMATION OF AUTONOMOUS SYSTEMS
(Professional Elective – IV)

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, Design and Analysis of Algorithms, Artificial Intelligence, Machine Learning, Deep Learning.

Course Objectives: The objectives of this course are,

1. To cover the basics of decision-making under partially known or uncertain environments.
2. To introduce decision theory and reinforcement learning.

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

1. Identify different motion planning schemas under different environments.
2. Define different states and have mathematical knowledge on drop-off and estimation algorithms.
3. Analyze different planning and decision techniques.
4. Appraise different methods to solve finite Markov decision problem.
5. Distinguish different decision making techniques under uncertain environment.
6. Apply different information gathering techniques and associate Human-robot interaction.

UNIT - I

Introduction, Autonomous Robots, Robot Arm Manipulators, Mobile Robots, Multi-Robot Systems and Swarms, Perception, Planning, Control, and Coordination for Autonomous Vehicles, Motion-Planning Schemes: Known Configuration Spaces: Potential-Field Algorithms, Grid-Based Algorithms, Sampling-Based Algorithms; Motion-Planning Schemes: Partially Known Configuration Spaces: BUG0, BUG1, and BUG2.

UNIT - II

State Estimation: Least Square Estimation (Linear, Weighted, Non-linear); Probability Basics; RANSAC for Outlier Rejection; State Estimation Problem; Bayes Filter; Gaussian Filters; Kalman Filter; Extended Kalman Filter; Unscented Kalman Filter; Information Filter.

UNIT - III

Planning: STRIPS-planning; Planning domain description language (PDDL); Graph search - A* ; Markov Decision process-Uncertainty in Action Selection, Value Iteration, Finite Environments, POMDPs ; Dynamic Programming, Monte Carlo Approximation, Temporal difference learning.

UNIT - IV

Decision making under Uncertainty: Introduction to Reinforcement learning, Imitation Learning, Bayesian reinforcement learning- Acting on Unknown MDPs, Bayesian method in Continuous spaces, solving POMDPs; Bandit Problem-Introduction; Finite Stochastic Bandit problem; Reinforcement learning in MDPs.

UNIT - V

Information Gathering and Exploration: Gaussian Processes and exploration algorithms; Human-robot interaction: Introduction, Design in HRI, Design methods, Spatial Interaction, Verbal and nonverbal Interactions; Research methods in HCI.

Text Books:

1. Eugene Kagan, Nir Shvalb, Irad Ben-Gal, "Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication, and Swarming", Wiley, 2019
2. Pendleton S.D., Andersen H., Du X., Shen X., Meghjani M., Eng Y. H., Rus D., Ang M.H. “Perception, Planning, Control, and Coordination for Autonomous Vehicles. Machines” 2017. https://doi.org/10.3390/machines5010006

Suggested Reading:

1. Sebastian Thrun, Wolfram Burgard, Dieter Fox, “Probabilistic robotics", MIT Press, 2005.
2. Richard S. Sutton, Andrew G. Barto, "Reinforcement Learning: An Introduction", 2018, MIT Press.

3. Christos Dimitrakakis, Ronald Ortner, "Decision Making Under Uncertainty and Reinforcement Learning", 2021.
4. Bartneck, C., Belpaeme, T., Eyssel, F., Kanda, T., Keijsers, M., & Sabanovic, S, “Human-Robot Interaction – An Introduction”, Cambridge University Press, 2020.
5. Todd Litman, "Autonomous Vehicle Implementation Predictions: Implications for Transport Planning", Victoria Transport Policy Institute, 2022.
6. Mykel J. Kochenderfer, "Decision Making Under Uncertainty: Theory and Application”, MIT Press, 2015.
7. Wen Yu, Adolfo Perrusquia, "Human-Robot Interaction Control Using Reinforcement Learning", Wiley, 2021.
8. Vincent A. W. J. Marchau, Warren E. Walker, Pieter J. T. M. Bloemen, Steven W. Popper , "Decision Making under Deep Uncertainty: From Theory to Practice", Springer, 2019.
9. Victor Becerra, "Autonomous Control of Unmanned Aerial Vehicles", MDPI, 2019.

Online Resources:

1. Autonomous Systems, https://www.udacity.com/school-of-autonomous-systems

20CSE25

SOCIAL COMPUTING
(Professional Elective – V)

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: Data Structures, Machine Learning, Programming for problem solving.

Course Objectives: The objectives of this course are,

1. To familiarize social networks and their representation.
2. To understand the impact of social networks on society.
3. To study and analyze the social network search models.
4. To plan and execute network analytical computations.
5. To collect network data in different ways from different sources.

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

1. Identify the significance of social networks, representation, ranking techniques and challenges.
2. Understand a broad range of social networks concepts and theories.
3. Ascertain the network analysis knowledge in a diversified aspect of society.
4. Analyze social network links and web search.
5. Differentiate between centralized and decentralized search models.
6. Generate and communicate the analysis results and impact of social networks.

UNIT - I

Introduction to Social Networks: Challenges, Google page rank, searching on network, link prediction, contagious, marketing on social networks.
Graphs: Basic definitions, paths and connectivity, distance and breadth first search, network datasets.
Strong and Weak Ties: Triadic closure, strength of weak Ties, Tie strength and network structure in large-scale data, social media and passive engagement, closure, structured holes and social capital.

UNIT - II

Networks in surrounding contexts: Homophily, selection and social influence, affiliation, tracking link formation in online data, spatial model of segregation.
Positive and negative relationships: Structural balance, characterizing the structure of balanced networks, applications of structured balance.

UNIT - III

Link analysis and Web search: Searching the web, ranking, link analysis using hubs and authorities, page rank, link analysis in modern web search, applications beyond web.
Cascading behavior in networks: Diffusion in networks, modeling diffusion, cascades and clusters, thresholds and role of weak Ties, extensions of cascade model, knowledge, thresholds and collective actions.

UNIT - IV

Power Laws and Rich-get-Richer Phenomena: Popularity as a network phenomenon, power laws, rich-get-richer models, unpredictability of rich-get-richer effects, effects of search tools and recommender systems, analysis of rich-get-richer processes. Pseudo core- how to go viral on the web. Case study on rich-get-richer.

UNIT - V

Small world phenomenon: Six degrees of separation, structured and randomness, decentralized search, modeling the process of decentralization search, empirical analysis and generalized models, core-peiphery structures and difficulties in decentralized search, analysis of decentralized search. Case Study on small world phenomenon.

Text Books:

1. David Eas ley, Jon Kleinberg, “Networks, Crowds and Markets”, Cambridge Press, 2010.
2. Mathew O Jackson “Social and Economic Networks”, Princeton University, 2010.

Suggested Reading:

1. Stephen P Borgatti, Martin G. Everett, Jeffrey C. Johnson, "Analyzing Social Networks", 2018, Second edition, SAGE Publications Ltd.
2. Krishna Raj P.M., Ankith Mohan, K.G. Srinivasa, "Practical Social Network Analysis with Python", Computer Communications and Networks, Springer; 1st Edition, 2018.

Online Resources:

1. https://nptel.ac.in/downloads/106106169/

20CSE26

HUMAN COMPUTER INTERACTION
(Professional Elective – V)

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, Internet and web technologies.

Course Objectives: The objectives of this course are,
1. To learn the foundations of Human Computer Interaction.
2. To be familiar with the design technologies for computer interaction and guidelines for web user interface.
3. To learn the ecosystem and tools of mobile HCI.

Course Outcomes: On successful completion of the course, students will be able to,
1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand and analyze the mobile ecosystem and tools for mobile design.
5. Design an interactive mobile interfaces for mobile applications and widgets.
6. Design an interactive web interface for web applications.

UNIT - I

Foundations and Introduction: The human, the computer, The Interaction, Paradigms, Our perception is biased; our vision is optimized to see structure. Perception Biased by Experience, Perception Biased by Current Context, Perception Biased by Goals, Design implications.

UNIT - II

Vision and Memory: Our Vision is Optimized to See Structure, We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action.

UNIT - III

Recognition, Recall and Decision Making: Recognition is Easy, Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational.

UNIT - IV

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile Design: Elements of Mobile Design, Tools.

UNIT - V

Designing Web Interfaces: Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.

Case Study - 1: Design a Mobile App interface or Widget interface by following designing rules

Case Study - 2: Design a Web application interface by following designing rules

Text Books:

1. Jeff Johnson "Designing with the Mind in Mind: Simple Guide to Understanding", 2nd edition, Elsevier Inc., 2014.
2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction", 3rd edition, Pearson Education Limited, 2004.
3. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009.
4. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

Suggested Readings:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface", 5th Edition, Pearson Education Limited, 2013.
2. John Haugeland, "Mind Design II", 2nd Edition, Revised and enlarged edition, The MIT Press, 1997.

20CAE10

COMPUTATIONAL NEUROSCIENCE
(Professional Elective – V)

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: Artificial Intelligence, Machine Learning.

Course Objectives: The objectives of this course are,

1. To learn computational neuroscience models and their applications.
2. To explore the computational principles governing various aspects of vision, sensory-motor control, learning, and memory.
3. To learn representation of information by spiking neurons, processing of information in neural networks, and algorithms for adaptation and learning.

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

1. Understand the fundamentals of computational neuroscience.
2. Analyse the Neural Encoding Models.
3. Make use of Neurons & Neural coding to extract information.
4. Analyse the Computing in Carbon and Computing with Networks.
5. Analyse the various learning methodologies.
6. Evaluate the Performance of different neurological models.

UNIT - I

Introduction: Introduction & Basic Neurobiology Computational Neuroscience: Descriptive Models, Computational Neuroscience: Mechanistic and Interpretive Models, the Electrical Personality of Neurons, Making Connections: Synapses, Time to Network: Brain Areas and their Function.

UNIT - II

Neural Encoding Models: Neural Encoding, Simple Models, Feature Selection, Variability, Vectors and Functions, Convolutions and Linear Systems, Change of Basis and PCA.

UNIT - III

Extracting Information from Neurons & Neural coding: Neural Decoding and Signal Detection Theory, Population Coding and Bayesian Estimation, Reading Minds: Stimulus Reconstruction, Information and Entropy, Calculating Information in Spike Trains, Coding Principles.

UNIT - IV

Computing in Carbon and Computing with Networks: Modelling Neurons, Spikes, Simplified Model Neurons, A Forest of Dendrites, modelling Connections Between Neurons, Introduction to Network Models, The Fascinating World of Recurrent Networks.

UNIT - V

Plasticity in the Brain & Learning: Synaptic Plasticity, Hebb's Rule, and Statistical Learning, Introduction to Unsupervised Learning, Sparse Coding and Predictive Coding.

Learning from Supervision and Rewards: Neurons as Classifiers and Supervised Learning, Reinforcement Learning: Predicting Rewards, Reinforcement Learning: Time for Action.

Text Books:

1. Fundamentals of Computational Neuroscience, Thomas Trappenberg, OUP Oxford; 2nd edition, 2009.
2. An Introductory Course in Computational Neuroscience, Paul Miller, The MIT Press; 1st edition, 2018
3. Paul Miller, “An Introductory Course in Computational Neuroscience”, The MIT Press, 2018

Suggested Reading:

1. Britt-Anne Anderson, “Computational Neuroscience and Cognitive Modelling: A Student's Introduction to Methods and Procedures”, SAGE Publications Ltd, 2014.
2. Ranu Jung, Dieter Jaeger, “Encyclopedia of Computational Neuroscience”, Springer, 2015.

3. Trappenberg, Thomas, "Fundamentals of computational neuroscience", OUP Oxford, 2009.
4. Arbib, Michael A., and James J. Bonaiuto, eds, "From neuron to cognition via computational neuroscience", MIT Press, 2016.

Online Resources:

1. https://nptel.ac.in/courses/102106023
2. https://onlinecourses.nptel.ac.in/noc22_ee66
3. https://www.coursera.org/learn/computational-neuroscience#syllabus
4. https://www.edx.org/course/computational-neuroscience-neuronal-dynamics-of-co

20CSE27

DISTRIBUTED SYSTEMS
(Professional Elective - V)

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: Operating Systems, Computer Networks.

Course objectives: The objectives of this course are,

1. To provide students with contemporary knowledge in distributed systems.
2. To equip students with skills to analyze and design distributed applications.
3. To provide skills to measure the performance of distributed synchronization algorithms.

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

1. Understand the basic elements and concepts related to distributed systems.
2. Illustrate the middleware technologies such as RPC, RMI and Object based middleware that support distributed applications.
3. Analyze the various techniques used for clock synchronization and mutual exclusion.
4. Demonstrate the concepts of resource and process management and synchronization algorithms, consistency and replication management.
5. Apply the knowledge of distributed file system for analysing various file systems like NFS, AFS and the experience in building large-scale distributed applications.

UNIT - I

Introduction to Distributed Systems: Characterization of Distributed Systems: Issues, goals, and types of distributed systems, Distributed System Models, Hardware concepts, Software Concept.
Middleware: Models of Middleware, Services offered by middleware, Client Server model.

UNIT - II

Communication: Stream Oriented Communication, Group Communication.
Synchronization: Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure.
Non Token based Algorithms: Lamport Algorithm, Ricart–Agrawala‘s Algorithm, Maekawa‘s Algorithm
Token Based Algorithms: Suzuki-Kasami‘s Broadcast Algorithms, Singhal‘s Heuristic Algorithm, Raymond‘s Tree based Algorithm, Comparative Performance Analysis.

UNIT - III

Resource and Process Management: Desirable Features of global Scheduling algorithm, Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads, Virtualization, Clients, Servers, Code Migration.

UNIT - IV

Consistency, Replication and Fault Tolerance, Introduction to replication and consistency, Data-Centric and Client Centric Consistency Models, Replica Management.
Fault Tolerance: Introduction, Process resilience, Reliable client-server and group communication, Recovery.

UNIT - V

Distributed File Systems and Name Services: Introduction and features of DFS, File models, File Accessing models, File-Caching Schemes, File Replication.
Case Study: Distributed File Systems (DSF), Network File System (NFS), Andrew File System (AFS)
Introduction to Name services and Domain Name System, Directory Services,
Case Study: The Global Name Service, the X.500 Directory Service.
Designing Distributed Systems: Google Case Study

Text Books:

1. Andrew S. Tanenbaum and Maarten Van Steen, “Distributed Systems: Principles and Paradigms”, 3rd edition, Pearson Education, 2017.
2. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems: Concepts and Design”, 5th Edition, Pearson Education, 2012.

Suggested Reading:

1. Kleppmann, Martin, “Designing data-intensive applications: the big ideas behind reliable, scalable, and maintainable systems”, 1st Edition, O'Reilly Media, 2018.
2. M. L. Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

20CSE28

SOFTWARE PROJECT MANAGEMENT
(Professional Elective – V)

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: Software Engineering, Organizational behaviour.

Course Objectives: The objectives of this course are,

1. To learn the importance of software process maturity & understand related concepts.
2. To understand the specific roles within a software organization related to project and process management.
3. To understand the basic infrastructure competences.
4. To understand the basic steps of project and process planning, management, quality assurance and their relationships.

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

1. Apply suitable CMM for specific scenarios and determine the effectiveness.
2. Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
3. Compare and differentiate organization and project structures.
4. Implement a project to manage project schedule, expenses and resource with the application of suitable project management tools.
5. Identify and analyze SPM practices.

UNIT - I

Software Process Maturity: Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

UNIT - II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

UNIT - III

Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments. Process Planning Work break down structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT - IV

Project Organizations: Line-of- business organizations, project organizations, evolution of organizations, process automation.

Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

UNIT - V

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

Text Books:

1. Watts S. Humphrey, “Managing the Software Process”, Pearson Education, 2002.
2. Walker Royce, “Software Project Management”, Pearson Education.

Suggested Reading:

1. Robert Wysocki, "Effective Project Management: Traditional, Agile, Extreme", Sixth edition, Wiley India, 2011.
2. Watts S. Humphrey, "An Introduction to the Team Software Process", Pearson Education, 2000.
3. James R. Persse, "Process Improvement essentials", O'Reilly, 2006.
4. Bob Hughes, Mike Cotterell "Software Project Management", fourth edition, TMH, 2006.
5. Andrew Stellman, Jennifer Greene, "Applied Software Project Management", O'Reilly, 2006.
6. Jennifer Greene & Andrew Stellman "Head First PMP", O'Reilly, 2007.
7. Richard H. Thayer & Edward Yourdon, "Software Engineering Project Management", 2nd edition, Wiley India, 2004.
8. Scott Berkun "The Art of Project Management", SPD, O'Reilly, 2011.
9. Andrew Stellman & Jennifer Greene, "Applied Software Project Management", SPD, O'Reilly, 2011.
10. Jim Highsmith, "Agile Project Management", Pearson education, 2004.

20CSE29

DESIGN PATTERNS
(Professional Elective – V)

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: Database management systems, OOPs, UML.

Course Objectives: The main objectives of this course are,
1. To understand the fundamental concepts of C++ and the design patterns,
2. To learn user interfaces, standards of designing a document editor.
3. To understand the structural and behavioral patterns.
4. To learn about the dynamics of the design patterns.

Course Outcomes: On Successful completion of this course, student will be able to,
1. Apply formal notations of C++ and develop patterns of user choice to accomplish user interface design.
2. Interpret document structure, formatting, look and feel standards and Multiple Window Systems to design document editor for a case study.
3. Demonstrate abstract factory to design and develop catalog pattern and Adapter, Bridge, Composite, Decorator of Structural Patterns.
4. Outline Façade, Flyweight, Proxy of behavioral patterns.
5. Discuss the Iterator, Mediator, Observer, State, Strategy, Template Method, Visitor of Behavioral Patterns-2 and its consequences.
6. State, Strategy, Template Method, Visitor of Behavioral Patterns-3 and its consequences.

UNIT - I
Review of Formal Notations and Foundation Classes in C++: Class Diagram, Object Diagram, Interaction Diagram Examples, List, Iterator, List Iterator, Point, Rect, Coding in C++.
Introduction to Design Patterns: Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing The Catalog, Solving of Design Problems Using Design Patterns, Selection of A Design Pattern, Use of Design Patterns.

UNIT - II
Designing a Document Editor: A Case Study: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

UNIT - III
Design Patterns Catalog: Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.
Structural Patterns-1: Adapter, Bridge, Composite, Decorator. Structural Patterns-2 and Behavioral Patterns-1: Structural Patterns: Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT – IV
Behavioral Patterns: Chain of Responsibility Command, Interpreter.
Behavioral Patterns-2: Iterator, Mediator, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

UNIT - V
Behavioral Patterns-3: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns, Expectations from Design Patterns.

Text Books:
1. Gamma, Belm, Johnson, “Design Patterns: Elements of Reusable Object Oriented Software”, Pearson Education, 1995.
2. Eric Freeman, “Head First Design Patterns”, O’reilly-SPD.

Suggested Reading:

1. Cooper, “Java Design Patterns”, Pearson Education.
2. Horstmann, “Object Oriented Design and Patterns”, Wiley.

Online Resources:

1. shop.oreilly.com/product/9780596007126.do
2. ww.amazon.com/Design-Patterns-Elements.../dp/0201633612

20PYO01

HISTORY OF SCIENCE AND TECHNOLOGY
(Open Elective – III)

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 the course is to make the student

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the medieval period and during the Industrial revolution. .
3. Aware of modern scientific developments from 19th century onwards.

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

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT - I

Science - The Beginning (through 599 BCE): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BCE - 529 CE): Philosophy- a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT - II

Medieval Science (530 CE - 1452 CE): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, Revival of science in Europe, Technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 CE – 1659 CE): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT - III

Scientific Method: Measurement and Communication (1660 CE – 1734 CE): European domination, the scientific method, Major advances.

The Industrial Revolution (1735 CE – 1819 CE): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT - IV

Science and Technology in the 19th Century (1820 CE – 1894 CE): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 CE – 1945 CE): The growth of 20thcentury science, new philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT - V

Big Science and the Post-Industrial Society (1946 CE – 1972 CE): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 CE – 2015 CE): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Text Books:

1. Bryan Bunch and Alexander Hellemans, “The History of Science and Technology”, Houghton Mifflin Company (New York), 2004.
2. JD Bernal, “Science in History”, 4 Volumes, Eklavya Publishers, 2012.

Suggested Readings:

1. “The 100 Most Influential Scientists of All Time”, Edited by Kara Rogers, Britannica Educational Publishing, 2010.
2. Alberto Hernandez, “A Visual History of Science and Technology”, the Rosen Publishing Group, 2016.

20MEO03

RESEARCH METHODOLOGIES
(Open Elective – III)

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 main objectives of this course are

1. To make the students to formulate the research problem.
2. To identify various sources for literature review and data collection.
3. To prepare the research design.
4. To equip the students with good methods to analyze the collected data.
5. To explain how to interpret the results and report writing.

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

1. Define research problem.
2. Review and assess the quality of literature from various sources.
3. Understand and develp various sresearch designs.
4. Analyze problem by sttistical techniques: ANOVA, F-test, Chi-square.
5. Improve the style and ormat of writing a report for technical paper/Journal report.

UNIT – I

Research methodology: Objectives and motivation of research, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs. empirical, research approaches, significance of research, research methods vs. methodology, research process, criteria of good research, problems encountered by researchers in India, technique involved in defining a problem.

UNIT – II

Literature survey: Importance of literature survey, sources of information-primary, secondary, tertiary, assessment of quality of journals and articles, information through internet.

UNIT – III

Research design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, steps in sample design.

UNIT – IV

Data collection: Collection of primary data, Secondary data, measures of central tendency-mean, mode, median, measures of dispersion- range, mean deviation, standard deviation, measures of asymmetry (skewness), important parametric tests -z, t, F, Chi-Square, ANOVA significance.

UNIT – V

Research report formulation and presentation: Synopsis, dissertation, technical paper and journal paper, writing research grant proposal, making presentation with the use of visual aids, writing a proposal for research grant.

Text Books:

1. C.R Kothari “Research Methodology Methods & Technique”, New Age International Publishers, 2004.
2. R. Ganesan “Research Methodology for Engineers”, MJP Publishers, 2011.
3. Vijay Upagade and AravindShende “Research Methodology”, S. Chand & Co. Ltd., New Delhi, 2009.

Suggested Reading:

1. G. NageswaraRao “Research Methodology and Quantitative methods”, BS Publications, Hyderabad, 2012.
2. Naval Bajjai “Business Research Methods”, Pearson Education, 2011.

20MEO04

ENTREPRENEURSHIP
(Open Elective – III)

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 main objectives of this course are

1. Concept and procedure of idea generation.
2. The nature of industry and related opportunities and challenges.
3. Elements of business plan and it's procedure.
4. Project management and its techniques.
5. Behavioural issues and Time management.

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

1. Understand the concept and essence of entrepreneurship.
2. Identify business opportunities and nature of enterprise.
3. Analyze the feasibility of new business plan.
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects.
5. Use behavioral, leadership and time management aspects in entrepreneurial journey.

UNIT - I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT - II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT - III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selectionof technology and collaborative interactions.

UNIT - IV

Project management: During construction phase, project organization, project planning and control usingCPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT - V

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction.

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd, 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi, 2015.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5th edition, Tata Mc Graw Hill Publishing Company. Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.

20ECO05

SYSTEMS AUTOMATION AND CONTROL
(Open Elective – III)

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

Prerequisite: Knowledge about physical parameters in industry is required

Course Objectives: The objectives of this course are,
1. Learn the concepts industrial control systems.
2. Learn how to measure the physical parameters in industry.
3. Learn the applications of Robots in industry.

Course Outcomes: On Successful completion of this course, student will be able to,
1. Understand the features of various automatic and process control systems.
2. Define and analyze various measuring parameters in the industry.
3. Compare performance of various controllers (P, PD, PI, and PID).
4. Illustrate the role of digital computers in automation.
5. Develop various robot structures for different applications.

UNIT - I
Introduction to Automatic Control Systems: Purpose of Automatic Control, How an Industrial Control System is implemented, Introduction to Automatic Control theory.
Sensors: Sensor definition, Different types of Sensors: Motion, Position, Force, Level sensors, and Thermo couples.

UNIT - II
Theory of Measurements: Measurement goals and concepts, Scale factor, Linearity, accuracy, Range, Resolution, Precision and repeatability.
Measurement Techniques and Hardware: Typical Sensor outputs, Bridge measurements: General equation for bridge balance, Resistance balanced Wheatstone bridge, Variable voltage type measurements, Frequency type measurements.

UNIT - III
Process Controllers: What is a Controller, uses of Controllers, Open loop and closed loop Control, proportional, PD, PI, PID Controllers, Analog and Digital methods of Control.
Controller Hardware: Analog and Digital Controllers.

UNIT - IV
Digital Computers as Process Controllers: Use by Digital Computer for process control, Information required by the computer, Information required by the process, Computer Interface electronics, Digital Computer input-output, computer processing of data, Digital Process control computer design, Computer programming.
Actuators: Electro mechanical - Linear motion and rotary motion solenoids, DC motors, AC motors and Stepped motors.

UNIT - V
Robots: What are robots, Robots and process Control systems, Degrees of freedom, factories of the future, Delivery, Disposal and transport systems, Sensing elements, Robot Classifications and Applications. Trouble shooting System failures: Preliminary steps and other troubleshooting aids.

Text Books:
1. Ronald P. Hunter, "Automated process control systems – concepts and Hardware", 2/e, PHI, 1987.
2. Norman A. Anderson, "Instrumentation for process measurement and Control", 3/e, CRC Press, 2005.

Suggested Reading:
1. Kuo B. C, "Automatic Control Systems", 9th edition
2. A.K Sawhney, "A course on Electrical and Electronic Measurements and Instrumentation".

20EEO03

ENERGY AUDITING
(Open Elective – III)

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

Prerequisites: Students should have prior knowledge on different Electrical Energy Generation systems, measuring instruments and basics of power systems.

Course objectives: The objectives of this course are,

1. To know the concept of Energy auditing.
2. To understand the formulation of efficiency for various engineering systems.
3. To explore the different ways to design various technologies for efficient engineering systems.

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

1. Know the current energy scenario and various energy sources.
2. Understand the concepts of energy auditing.
3. Evaluate the performance of existing engineering systems.
4. Explore the methods of improving energy efficiency in different engineering systems
5. Design different energy efficient appliances.

UNIT - I

Basics of Energy and its various forms: Overview of Engineering, elements Solar energy, electricity generation methods using solar energy, PV cell, elements of wind energy, electricity generation using wind energy, elements of Bio energy, Bio mass energy conservation, elements of Geothermal energy, sources of Geo thermal energy, sources of Chemical energy, fuel cells, Energy Scenario in India.

UNIT - II

Energy Auditing-I: Introduction, Need for energy audit, types of energy audit: Preliminary audit,General/mini Audit, Investment-grade/ Comprehensive audit. Major energy consuming equipment and systems, Energy audit team, energy Auditing methodology: preliminary and detailed. Process flow diagram, Energy Audit report format.

UNIT - III

Energy Auditing-II: For buildings: Energy Auditing Instruments, Energy Efficiency, Energy Auditing for buildings- stages in programs, surveying, measurements, and model analysis. Energy audit form of commercial buildings such as Hotel, checklist for Energy saving measures.

UNIT - IV

Energy Efficient Technologies-I: Energy Efficient Technology in Mechanical Engineering: Heating, ventilation, and air-conditioning; Evaporative coolers, Air conditioners -types such as Portable; Central AC, Window AC and Split AC.

Energy Efficient Technology in Electrical Engineering: Electricity billing, Power Factor Improvement-Regenerated Energy in Lifts and Escalators.

UNIT-V

Energy Efficient Technologies-II: Energy Efficient Technology in Civil Engineering: Green building-features- concept of Embodied energy -Building design-Green construction-Net Zero Energy Building - **Energy Efficient Technology in Chemical Engineering**: Green chemistry, - Battery Managementsystems – concept and salient features topologies.

Text Books:

1. Umesh Rathore, 'energy management', Kataria publications, 2nd ediiton, 2014.
2. G.Hari hara Iyer : Green Building – Fundamentals , Notion Press .com2022
3. 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.

Suggested reading:

1. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects

20EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

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

Course Objectives: The main objectives of this course are

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectual's constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

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

1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

UNIT - I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

UNIT - II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights - To Equality, to certain Freedom under Article 19, to Life and Personal Liberty under Article 21. Fundamental Duties - the legal status.

UNIT - III

Union Government and its Administration: Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President's role, power and position.

UNIT - IV

Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism.

UNIT - V

Local Self Government: District's Administration Head (Collector): Role and Importance. Municipalities & **Municipal Corporations:** Introduction, Chairperson/Mayor, Commissioner and Role of Elected Representatives. **Panchayati Raj:** Introduction, Zilla Panchayat, Chairperson, CEO, Elected Officials and their roles. **Block/Mandal level:** Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. Ed Prof V Ravindra Sastry, "Indian Government & Politics", Telugu Akademy, 2nd edition, 2018.
2. "Indian Constitution at Work", NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. "The Constitution of India", 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, "Framing of Indian Constitution", 1st Edition, 2015.
3. M. P. Jain, "Indian Constitution Law", 7th Ed. Lexis Nexis, 2014.
4. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084 /Script.pdf

20CSC31

CRYPTOGRAPHY AND NETWORK SECURITY 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: Data communication and computer networks.

Course Objectives: The objectives of this course are,

1. To provide practical understanding of cryptography and its application to network security.
2. To learn various approaches on encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To familiarize with symmetric and asymmetric cryptography.
4. Able to understand the significant functionalities of secure communication.

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

1. Identify basic security attacks and services
2. Design symmetric and asymmetric key algorithms for cryptography
3. Create and use of Authentication functions
4. Identify and investigate network security threat
5. Analyze and design network security protocols

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
    a. Ceaser cipher
    b. Substitution cipher
    c. Hill Cipher
    d. Play fair Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text “Hello world” using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.
12. Implement Simple Columner Transposition technique and Advanced Columner Transposition technique
13. Implement Euclidean Algorithm and Advanced Euclidean Algorithm
14. Familiarize the cryptographic tools (opencv)

Text Books:

1. William Stallings, “Cryptography and Network Security: Principles and Practice” Pearson Education, 6th Edition.
2. Chris Brenton, “Mastering Network Security” Bk & Cd-Rom Edition 2017.

Suggested Reading:

1. J.W. Rittiaghouse and William M.Hancok “Cyber Security Operations Handbook” Elseviers.
2. Eric Chou, “Mastering Python Networking” 3rd Edition, 2020.
3. Jean-Philippe Aumasson “Serious Cryptography: A Practical Introduction to Modern Encryption”, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs16/preview

20CSE30

DEEP LEARNING LAB
(Professional Elective – IV)

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: Artificial Intelligence, Machine Learning.

Course Objectives: The objectives of this course are,

1. To understand basic concepts of Deep learning and their applications.
2. To evaluate Deep learning methods, models and algorithms.
3. To analyze CNN and RNN algorithms and their applications.

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

1. Implement various learning models.
2. Design and develop various Neural Network Architectures.
3. Analyze various Optimization and Regularizations techniques of deep learning.
4. Analyze various pretrained models using Convolution Neural Networks.
5. Ability to apply RNN techniques to solve different applications.
6. Evaluate the Performance of different models of Deep learning networks.

List of Experiments:

1. Implementation of Classification with Multilayer Perceptron using Scikit-learn with MNIST Dataset.
2. Understanding of Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch.
3. Improve the performance of Deep Learning models with Hyper-Parameter Tuning.
4. Compare the Performance of various Optimization techniques of Momentum Based GD, Stochastic GD, Adam.
5. Implementation of Denoising autoencoders.
6. Compare the Performance of the Classification model using various Regularization Techniques.
7. Train a Deep learning model to classify a given image dataset using pre trained model of AlexNet, VGGNet and compare their performance.
8. Implementation of deep learning model using Guided Backpropagation.
9. Implementation of RNN for text generation.
10. Implementation of Encoder Decoder Models.

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., “Deep Learning “, MIT Press, 2016.
2. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
3. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
4. Huang, Shih-Chia, and Trung-Hieu Le. Principles and labs for deep learning. Academic Press, 2021.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

20CSE31

BIG DATA ANALYTICS LAB
(Professional Elective – IV)

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: Database management systems, Programming for problem solving, OOPs.

Course Objectives: The objectives of this course are,

1. To implement MapReduce programs for processing big data.
2. To realize storage of big data using MongoDB.
3. To analyze big data using machine learning techniques such as Decision tree classification and clustering.

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

1. Understand Configuration of various big data Frame Works.
2. Apply various visualization techniques to explore data.
3. Demonstrate data base operations using MongoDB.
4. Process big data using Hadoop framework.
5. Build and apply Map-Reduce & NoSQL Concepts.
6. Perform data analysis with machine learning methods.

List of Experiments:

1. Install, configure and run python, numPy and Pandas.
2. Install, configure and run Hadoop and HDFS.
3. Visualize data using basic plotting techniques in Pyhton.
4. Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB.
5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.
6. Implement word count / frequency programs using MapReduce.
7. Implement a MapReduce program that processes a dataset.
8. Implement Linear Regression using SPARK
9. Implement Decision tree / Naïve base classification techniques using SPARK
10. Implement clustering techniques using SPARK

Case Studies:

1. Implement an application that stores big data in MongoDB / Pig using Hadoop / R.
2. Map Reduce I/O Formats-Text, key-value Map ReduceI/O Formats –Nline, Multiline
3. Map Side Join, Reduce side Join Building and Running a Spark Application Word count in Hadoop and Spark Manipulating RDD.

Text Books:

1. Mike Frampton, “Mastering Apache Spark”, Packt Publishing, 2015.
2. TomWhite, “Hadoop:TheDefinitiveGuide”, O’Reilly, 4thEdition, 2015.
3. NickPentreath, “Machine Learning with Spark”, PacktPublishing, 2015.
4. Mohammed Guller, “Big Data Analytics with Spark”, Apress, 2015
5. Donald Miner, Adam Shook, “Map Reduce Design Pattern”, O’Reilly, 2012

20CSE32

MOBILE APPLICATION DEVELOPMENT LAB
(Professional Elective – IV)

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, 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

20CSE33

BLOCKCHAIN TECHNOLOGY LAB
(Professional Elective – IV)

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: Data Structures, Cryptography and Network Security, Distributed Systems.

Course Objectives: The objectives of this course are,

1. To introduce the fundamental primitives of Blockchain and consensus protocols.
2. To explore various blockchain platforms.
3. To understand and develop smart contracts.
4. To understand the significance of Hyperledger Fabric.
5. To 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 primitives of Blockchain and consensus protocols.
2. Explore various blockchain platforms such as ethereum, fabric.
3. Identify the significance and working of Ethereum Platform.
4. Work with the smart contracts.
5. Implement the blockchain applications with Hyperledger Fabric.S
6. Apply blockchain in different application domains such as financial and supply chain sectors.

List of Programs:

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. Hyperledger Fabric Demo.
9. 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” 1st Edition, independently published, 2019.
2. Reed, Jeff, Smart contracts: “The essential guide to using blockchain smart contracts for cryptocurrency exchange” 1st Edition,, CreateSpace Independent Publishing Platform, 2016.

Suggested Reading:

1. Diedrich Henning, Ethereum: “blockchains, digital assets, smart contracts, decentralized autonomous organizations” 1st Edition, Wildfire Publishing, 2016.
2. Antonopoulos and Andreas M., “Mastering Bitcoin: unlocking digital cryptocurrencies” 1st Edition, O’Reilly Media, Inc., 2015.

Online Resources:

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

20CAE14

PLANNING AND ESTIMATION OF AUTONOMOUS SYSTEMS LAB
(Professional Elective – IV)

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: Probability, Calculus, Design and Analysis of Algorithms, Artificial Intelligence, Machine Learning, Deep Learning, Python

Course Objectives: The objectives of this course are,

1. To cover the concepts, principles and methods for decision-making under partially known or uncertain environments.
2. To learn decision theory and reinforcement learning.

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

1. Identify different motion planning schemas under different environments.
2. Implement different planning and decision techniques.
3. Appraise and implement methods to solve finite Markov decision problem under uncertain situation.
4. Understand different decision making techniques under uncertain environment.
5. Programming different autonomous system and interaction with environment.
6. Identify and explore autonomous system in real-life situations.

List of experiments:

1. State Estimation implementation using Bayes Filter
2. State Estimation implementation using Kalman Filter
3. Implement path planning algorithms - Search-based Planning
4. Implement path planning algorithms - Sampling-based Planning
5. Implement Markov Decision process-Uncertainty
6. Implement POMDPs: Partially Observable Markov Decision Processes
7. Simulate the movement of the Drone
8. Simulate the movement of the Car
9. Simulate the movement of the multiple autonomous systems
10. Case study on Simulation of Real-time scenarios

Text Books:

1. Eugene Kagan, Nir Shvalb, Irad Ben-Gal, "Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication, and Swarming", Wiley, 2019.
2. Enes Bilgin, "Mastering Reinforcement Learning with Python", Packt Publishing, 2020.

Suggested Reading:

1. Todd Litman, "Autonomous Vehicle Implementation Predictions: Implications for Transport Planning", Victoria Transport Policy Institute, 2022.

Online Resources:

1. Autonomous Systems, https://www.udacity.com/school-of-autonomous-systems
2. AirmSim simulation, https://microsoft.github.io/AirSim/

20CSC32

TECHNICAL SEMINAR

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

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the topic
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Course Outcomes: At the end of the course, students will be able to:

1. Study and review research papers of new field/areas and summarize them.
2. Identify promising new directions of various cutting edge technologies in Computer Science and Engineering
3. Impart skills to prepare detailed report describing the selected topic/area.
4. Acquire skills to write technical papers/articles for publication.
5. Effectively communicate by making an oral presentation before the evaluating committee.

Seminars are to be scheduled **from 3rd week to the last week of the semester** and any change in schedule shall be discouraged. For the award of sessional marks students are **judged by three (3) faculty members** and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding Marks		
S. No.	Description	Max. Marks
1	Contents and Relevance	10
2	Presentation Skills	10
3	Preparation of Presentation slides	05
4	Question and Answers	05
5	Report in prescribed format	20

20CSC33

PROJECT PART - 1

Instruction	4 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	2

The objective of 'Project Phase – I' is to enable the student take up an investigative study in the broad field of Computer Science and Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an **individual basis or two/three students in a group**, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling / Simulation / Experiment / Design /Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Review the literature related to the problem area / selected topic.
2. Undertake problem identification, formulation and solution.
3. Prepare synopsis of the selected topic.
4. Gather the required data and Set up the environment for the implementation.
5. Conduct preliminary analysis/modelling/simulation experiment.
6. Communicate the work effectively in both oral and written forms.

Guidelines for awarding CIE (Max. Marks: 100)		
Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report Submission
Department Review Committee (DRC)	5	Relevance of the Topic
	5	Presentation Slide Preparation
	5	Presentation
	5	Question and Answers
	5	Quality of Report

20CSI03

INTERNSHIP - III

Instruction	5 to 6 weeks / 135 Hours
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	3

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

SCHEME OF INSTRUCTIONS AND EXAMINATION

Model Curriculum(R-20)

B.E. (Computer Science and Engineering)

SEMESTER –VIII

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.	20CSEXX	Professional Elective – VI	3	-	-	3	40	60	3
2.	20EGM04	Gender sensitization	2	-	-	2	-	50	-
3.	20CEM01	Environmental Science	2	-	-	2	-	50	-
PRACTICAL									
4.	20CSC39	Project Part - 2	-	-	8	-	100	100	4
		TOTAL	**7**	-	**8**	**-**	**140**	**260**	**7**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Professional Elective - VI	
20CAE05	Multi Agent Intelligent Systems
20CSE34	Cloud Computing
20CSE35	Augmented Reality and Virtual Reality
20CSE36	Cyber Security
20CSE37	High Performance Computing

20CAE05

MULTI AGENT INTELLIGENT SYSTEMS
(Professional Elective – VI)

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, Artificial Intelligence.

Course Objectives: The objectives of this course are,
1. To learn various types of multi agent systems and their applications.
2. To acquire the knowledge of various multi agent system architectures and their learning methods.
3. To understand multi agent decision making systems and their applications.

Course Outcomes: On Successful completion of this course, student will be able to,
1. Understand various aspects of multi agent systems and architecture of intelligent agents.
2. Understand of various types of reasoning Agents.
3. Acquire knowledge of multi agent systems communication and cooperation methods.
4. Classify various types of decision making processes for multi agent systems.
5. Use appropriate framework for agent communication and information sharing processes.
6. Explore different kinds of Auctions for multi agent environment and applications.

UNIT - I

Introduction: The Vision Thing, Some Views of the Field, Agents as a paradigm for software engineering, Agents as a tool for understanding human societies

Intelligent Autonomous Agents: Intelligent Agents, agent and objects, agents and expert systems, agents as intentional systems, Abstract Architectures for Intelligent Agents.

UNIT - II

Deductive Reasoning agents: Agents as theorem Provers, Agent-Oriented programming.

Practical Reasoning Agents: Practical Reasoning equals Deliberation plus Means-Ends Reasoning, Means-Ends Reasoning, HOMER, The Procedural reasoning System.

Reactive and Hybrid Agents: Reactive Agents -The subsumption architecture, PENGI, Limitations of reactive agents. Hybrid agents -Touring Machines.

UNIT - III

Understanding Each Other: Ontology Fundamentals, Ontology Languages, RDF.

Communicating: Speech Acts – Austin, Searle, Speech acts as rational action, Agent Communication Languages -KQML.

Working Together: Cooperative Distributed Problem Solving, Task sharing and Result sharing-Task sharing in the Contract Net. Result Sharing, Combining Task and Result Sharing, Handling Inconsistency, coordination.

UNIT - IV

Multi agent Decision Making - Multi Agent Interactions: Utilities and Preferences, Setting the Scene, The Prisoner's Dilemma.

Making Group Decisions: Social welfare Functions and Social Choice Functions, Voting Procedures- Plurality, Sequential majority elections.

Forming Coalitions: cooperative Games

UNIT - V

Allocating Scarce Resources: Classifying Auctions, Auctions for Single items - English auctions, Dutch auctions. Combinatorial auctions - Bidding Languages. Auctions in Practice-Online auctions, Adwords auctions

Applications: Agents for Workflow and Business Process Management, Agents for Distributed Sensing, Agents for Information Retrieval and Management, Agents for Electronic Commerce, Agents for Human - Computer Interfaces, Agents for Virtual Environments, Agents for Social Simulation, Agents for X.

Text Books:

1. Michae L Wooldridg E, "An Introduction to Multi Agent Systems", Wiley publications, 2nd Edition, 2009.

Suggested Reading:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 4th Global edition, 2021.
2. Gerhard Weiss, “Multiagent Systems”, Second Edition, 2016.

Online Resources:

1. https://www.coursera.org/lecture/modeling-simulation-natural-processes/multi-agent-systems-kAKyC

20CSE34

CLOUD COMPUTING
(Professional Elective – VI)

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: Data communication and computer networks.

Course Objectives: The objectives of this course are,

1. To understand the significance services of cloud computing.
2. To understand about the cloud infrastructure and Technologies.
3. To learn the security implementation features in cloud computing.

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

1. Understand the need of cloud technology and terminology.
2. Identify and understand the cloud infrastructure.
3. Write scripts for the automation of infrastructure and software deployment
4. Design solutions for the automation and migration of manual data centers.
5. Develop scripts for the automation of cloud services

UNIT – I

Era of Cloud Computing – Motivation, Elastic Computing and advantages- Multi-Tenant clouds, Elastic computing, Virtualized servers uses, Business model for Cloud Providers. Types of Clouds and Cloud Providers, Multi-Cloud, Hyperscalers, advantages of clouds; **Data Centre Infrastructure**- racks, aisles, pods, power and cooling, air cooling, thermal containment and hot/cold aisles, exhaust Ducts, lights-out data centers, smart network interfaces.

UNIT – II

Virtualization and Containers -Virtual machines, hypervisor, approaches to virtualization, advantages and disadvantages of VMs, Virtual I/O devices, VM migration; Traditional apps and elasticity on demand, isolation facilities in an OS, Linux namespaces for isolation, container approaches, Docker.

UNIT – III

Virtual Networks – Goals of a data center network, Network hierarchies, capacity, Fat Tree Designs. Link aggregation, VLANS, VXLAN, NAT, Managing virtualization and mobility, SDNs, openflow protocol, Programming networks; **Virtual Storage**: NAS, SAS, mapping virtual disks to physical disks.

UNIT – IV

Automation and Cloud Programming - Need of automation, levels, AIops, automation tools, automation of manual data center practices, evolution of automation; **Orchestration:** legacy of automating procedures, larger scope of automation, Kubernetes MapReduce, Microservices, Serverless computing, event processing, DevOps, Edge Computing and IIoT.

UNIT – V

Cloud security and Privacy – cloud specific problems, zero trust security model, identity management, privileged access management(PAM), AI technologies and their effects on their security,
Protection of remote access and privacy in a cloud environment, back doors, side channels and other concerns, firewalls.

Text Books:

1. Douglas Comer "The Cloud Computing Book: The Future of Computing Explained", Chapman and Hall/CRC, 1st Edition Kindle Edition, 2021.
2. Anthony T Velte, Toby J, Robert Elenpeter, "Cloud Computing – A Practical Approach", McGra Hill, 2010.
3. https://www.amazon.in/Cloud-Computing-Book-Future-Explained/dp/0367706806?asin=B097N7NKJD&revisionId=&format=4&depth=1

20CSE35

AUGMENTED REALITY AND VIRTUAL REALITY
(Professional Elective – VI)

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, Internet and web technologies, machine learning, deep learning.

Course Objectives: The objectives of this course are,

1. To explore the history of spatial computing and design interactions.
2. To understand the fundamental principles describing how hardware, computer vision algorithms functions.
3. To learn Virtual reality animation and 3D Art optimization.
4. To demonstrate Virtual reality.
5. To develop visualization tools.

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

1. Explain how the humans interact with computers.
2. Understand the design and implementation of the technologies for AR and VR systems.
3. Apply technical and creative approaches to make successful applications and experiences.
4. Design audio and video interaction paradigms.
5. Understand AR and VR best practices.
6. Apply VR/MR/AR in various fields in industry.

UNIT - I

How Humans interact with Computers: Introduction, modalities through the ages, types of common HCI modalities, new modalities, the current state of modalities for spatial computing devices, current controllers for immersive computing systems, hand tracking and hand pose recognition.
Designing for Senses: Envisioning a future, sensory technology explained, Sensory design, five sensory principles, Adobe's AR story.

UNIT - II

Virtual Reality for Art: A more natural way of making 3D art, VR for animation.
3D art optimization: Introduction, draw calls, using VR tools for creating 3D art, acquiring 3D models vs making them from scratch.
How augmented reality works: a brief history of AR, how and why to select an AR platform, mapping, platforms, other development considerations, the AR cloud.

UNIT - III

Virtual reality and augmented reality: cross platform theory, the role of game engines, understanding 3D graphics, portability lessons from video game design, simplifying the controller input.
Virtual reality toolkit: open source framework for the community.

UNIT - IV

Virtual Reality and Augmented Reality Development Best Practices: Handling Locomotion in VR and AR, Effective Use of Audio in VR and AR, Common Interactions Paradigms.
Character AI and Behaviors: Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

UNIT - V

Use Cases in Embodied Reality
The virtual and augmented reality health technology ecosystem: VR/AR health technology application design, case studies.
Key Principles of AR and VR for Sports
Virtual Reality Enterprise Training Use Cases and Ideal Training Scenarios.

Text Books:

1. Erin Pangilinan, Steve Lukas and Vasanth Mohan, “Creating Augmented & Virtual Realities: Theory and Practice for Next-Generation Spatial Computing”, 1st edition, O’REILLY, 2019.
2. Steve Aukstakalnis, “Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR”, Pearson Education, 2017.
3. Schmalstieg and Hollerer, “Augmented Reality: Principles & Practice”, Pearson Education, 2016.
4. Paul Mealy, “Virtual & Augmented Reality”, John Wiley & Sons, 2018.

Suggested Reading:

1. Greengard, Samuel, "Virtual Reality", MIT Press, 2019.
2. Robert Scoble, Shel Israel, "The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything", Patrick Brewster Press, 1st Edition, 2016.
3. Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", O’Reilly Media; 1st Edition, 2015.
4. Tony Parisi, “Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages", O’Reilly Media; 1 Edition, 2014.
5. Jos Dirksen, “Learning Three.js: The JavaScript 3D Library for WebGL", 2nd Revised Edition, Packt Publishing, 2015.
6. Jos Dirksen, “Learning Three.js: programming 3D animations and visualizations for the web with HTML5 and WebGL”, 3rd Edition, 2018.

20CSE36

CYBER SECURITY
(Professional Elective – VI)

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: Operating Systems, Data communications and computer networks, Cryptography and network security.

Course Objectives: The objectives of this course are,

1. To identify and understand methods and tools used in cybercrimes.
2. To collect, process, analyze and present Computer Forensics Evidence.
3. To understand the legal perspectives and organizational implications of cyber security.

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

1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Discuss the cyber offence and vulnerabilities in programming languages.
3. Identify the Tools and Methods used in cybercrimes.
4. Analyze and resolve cyber security issues and laws governing Cyberspace.
5. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
6. Interpret the commercial activities in the event of significant information security incidents in the Organization.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Buffer Overflow, How Browsers Work, Google Dorking, Scanning the Entire Internet: Masscan and Shodan.

Building Secure Software: Memory corruption attack, Vulnerability in programming language, Virtual memory layout of C Program, Buffer overflow attack in C and C++, Pointer attacks, Heap Overflow, Integer Overflow.

UNIT - III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, Injection Attacks, SQL Injection, Ransomware, Cross-Site Scripting Attacks, ARP Spoofing Attacks, SYN Floods and detecting SYN Scans.

UNIT – IV

Cyber Security: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments to IT Act, Positive and week areas of IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Data Protection Act 2019.

UNIT – V

Understanding Cyber Forensics: Introduction, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Challenges in Computer Forensics.

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Software Piracy, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd, 2011.
2. Malcolm McDonald “Web Security for Developers” Starch Press, June 2020.
3. Daniel G. Graham “Ethical Hacking: A Hands-on Introduction to Breaking in” Starch Press, 2021.
4. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, “Cyber Security and Cyber Laws”, Paperback, 2018.
2. Mark F Grady, Fransesco Parisi, “The Law and Economics of Cyber Security”, Cambridge university press, 2006.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
2. https://onlinecourses.swayam2.ac.in/cec20_cs15/preview

20CSE37

HIGH PERFORMANCE COMPUTING
(Professional Elective – VI)

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 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

20EGMO4

GENDER SENSITIZATION

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

Course Objectives: The objectives of this course are,

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

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

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I
Understanding Gender:
Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II
Gender and Biology:
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

UNIT – III
Gender and Labour:
Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT - IV
Issues of Violence
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
Gender: Co - Existence
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.

Additional Reading: Rosa Parks-The Brave Heart.

Text Books:

1. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012.
2. Abdulali Sohaila. "I Fought For My Life…and Won." Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Online Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

20CEM01

ENVIRONMENTAL SCIENCE

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

Course Objectives: The objectives of this course are,

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

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

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

UNIT - I

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V

Social Issues and the Environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, “Introduction to Environmental Science”, B S Publications, 2004.
2. Suresh K. Dhameja, “Environmental Studies”, S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao,” Environmental Pollution Control Engineering”, Wiley, 1991.
2. S. S. Dara, “A Text Book of Environmental Chemistry &Pollution Control”, S. Chand Limited, 2006.

20CSC39

PROJECT PART - 2

Instruction	8 Hours per week
Duration of End Examination	-
Semester End Examination	100 Marks
Continuous Internal Evaluation	100 Marks
Credits	6

The objective of 'Project: Part Phase - 2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Department Review Committee.

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

1. Demonstrate a sound technical knowledge of their selected topic.
2. Design engineering solutions to complex problems utilizing a systematic approach.
3. Conduct investigations by using research-based knowledge and methods to provide valid conclusions.
4. Create/select/use modern tools for the modelling, prediction and understanding the limitation of complex engineering solutions.
5. Communicate with engineers and the community at large in written and oral forms.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer.

Guidelines for awarding CIE (Max. Marks: 100)		
Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Department Review Committee (DRC)	10	Review 1
	15	Review 2
	25	Report Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to Publication
	10	Report Preparation
	10	Analytical/ Programming/Experimentation Skills

Guidelines for awarding SEE (Max. Marks: 100)		
Evaluation by	Max. Marks	Evaluation Criteria/Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the Project • Innovation, • Applications, • Live Research Projects, • Scope for further study, • Applications to Society
	20	Viva-Vice

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Model Curriculum(R-20)

OPEN ELECTIVE FOR OTHER PROGRAMME

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	
ODD SEMESTER									
1.	20CSO01	Fundamentals of Virtual Reality	3	-	-	3	40	60	3
2.	20CSO02	Introduction to Web Technology	3	-	-	3	40	60	3
3.	20CSO03	Introduction to Soft Computing	3	-	-	3	40	60	3
4.	20CSO04	Open Source Technologies	3	-	-	3	40	60	3
5.	20CSO05	Basics of Artificial Intelligence	3	-	-	3	40	60	3
6.	20CSO06	Fundamentals of Blockchain Technology	3	-	-	3	40	60	3
7.	20CSO07	Fundamentals of Software Engineering	3	-	-	3	40	60	3
EVEN SEMESTER									
8.	20CSO08	Basics of Machine Learning	3	-	-	3	40	60	3
9.	20CSO09	Fundamentals of DBMS	3	-	-	3	40	60	3
10.	20CSO10	Basics of Cyber Security	3	-	-	3	40	60	3
11.	20CSO11	Data Visualization Models	3	-	-	3	40	60	3
12.	20CSO12	Introduction to Mobile Application Development	3	-	-	3	40	60	3
13.	20CSO13	Basics of Cloud Computing	3	-	-	3	40	60	3
14.	20CSO14	Fundamentals of Computer Vision	3	-	-	3	40	60	3

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

20CSO01

FUNDAMENTALS OF VIRTUAL REALITY
(Open Elective)

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: Fundamentals of C++.

Course Objectives: The main objectives of this course are,

1. To introduce hardware and software components of virtual reality.
2. To provide knowledge about geometry of virtual worlds.
3. To give an overview of visual physiology, perception and audio in VR.
4. To explore the applications of VR in areas like defense and education.

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

1. Define Virtual Reality and describe the components of a VR system, input and output devices of virtual reality systems.
2. Apply geometric modeling to model real world scenarios.
3. Develop interfaces by using visual physiology, visual perception and audio.
4. Evaluate virtual reality systems for usability.
5. Explore the applications of VR systems in defense and telerobotics.

UNIT - I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.

Input Devices: Trackers, Navigation and Gesture Interfaces: Three-dimensional position trackers, navigation and manipulation interfaces, Gesture interfaces.

Output Devices: Graphics displays, sound displays and haptic feedback.

UNIT - II

Modeling: Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management.

Human Factors: Methodology and terminology, user performance studies, VR health and safety issues, VR and Society.

UNIT - III

Light and Optics: Basic Behaviour of light, Lenses, Optical aberrations, The Human eye, Cameras, Displays.

Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye movements, Implications for VR. **Visual Perception:** Depth perception, Motion perception, Color Perception.

UNIT - IV

Audio: The Physics of Sound, the Physiology of Human Hearing, Auditory Perception, Auditory Rendering.

Evaluating VR Systems and Experiences: Perceptual Training, Recommendations for Developers, Comfort and VR Sickness, Experiments on Human Subjects.

UNIT – V

Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and Construction, Science and Engineering, Health and Medicine, Aerospace and Defense, Education, Information control and Big Data Visualization, Telerobotics and Telepresence. Human Factors Considerations, Legal and Social Considerations, the Future: Short-term Outlook and Long-term Outlook

Text Books:

1. Gregory C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Second Edition, John Wiley & Sons, Inc., 2003.
2. Steven M. LaVelle, "Virtual Reality", Cambridge University Press, 2019.
3. Steve Aukstakalnis, "Practical Augmented Reality", Addison-Wesley, 2016.

Suggested Reading:

1. George Mather,"Foundations of Sensation and Perception", Second Edition, Psychology Press, 2009.
2. Peter Shirley, Michael Ashikhmin, and Steve Marschner, "Fundamentals of Computer Graphics", Third Edition, A K Peters/CRC Press, 2009.
3. K. S. Hale and K. M. Stanney, "Handbook on Virtual Environments", 2nd edition, CRC Press, 2015.

Online Resources:

1. http://msl.cs.uiuc.edu/vr/
2. https://nptel.ac.in/courses/106106139/

20CSO02

INTRODUCTION TO WEB TECHNOLOGY
(Open Elective)

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 acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. To learn developing web applications using PHP.
3. To understand the database access through the web.

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

1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like PHP
5. Build a data driven web site using Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems

UNIT - I

Fundamentals: Introduction to the Internet, WWW Browsers, Web Servers, URL, MIME, HTTPS.
Introduction XHTML: Basic Syntax Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists Tables, Forms, Cascading Style Sheets.

UNIT - II

Bootstrap: Introduction to bootstrap.
XML: Introduction, uses of XML, the Syntax of XML, XML Document Structure, DTD, Namespaces, XML schemas, displaying Raw XML Documents, displaying XML documents with CSS, XSLT style Sheets.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.
Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT - IV

Introduction to PHP: Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions, Output, Control Statements. Arrays, Functions, Pattern Matching, Form Handling, Cookies, Session Tracking.

UNIT - V

Database Access through the Web: Relational Databases, an Introduction to the Structured Query Language, Architectures for Database Access, the MySQL Database System.
Introduction to PHP MyAdmin, connection to MySQL server from PHP, execution of MySQL queries from PHP, receiving data from database server and processing it on webserver using PHP.

Text Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg, “Internet and World Wide Web How to program”, Pearson Education, 3rd edition, 2003.
2. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 4th Edition, 2008.
3. Adams, “PHP Programming the Complete Guide”, 2022.

Suggested Reading:

1. Chris Bates, “Web Programming: building internet applications”, Wiley, Second edition, 2002.
2. Steven Holzner, “The Complete Reference PHP”, McGraw Hill Education; Raunak PHP study edition, 2017.

20CSO03

INTRODUCTION TO SOFT COMPUTING
(Open Elective)

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.

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. Illustrates various soft computing techniques.
2. Analyze and design various learning models.
3. Apply the Neural Network Architecture for various Real time applications.
4. Apply approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Apply 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 algorithms.

Text Books:

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

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. N.P. Padhy and S.P. Simon,”Soft Computing: With Matlab Programming”, Oxford University Press, 2015.

Online Resources:

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

20CSO04

OPEN SOURCE TECHNOLOGIES
(Open Elective)

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 become familiar with Open Source Technologies.
2. To understand the principles and methodologies of OSS.
3. To understand the policies, licensing procedures and ethics of OSS.

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

1. Differentiate between Open Source and Proprietary software and Licensing.
2. Identify the applications, benefits and features of Open Source Technologies.
3. Evaluate open source project and management tools like Linux, Apache, and GIT.
4. Adapt to the usage of Open source tools and technologies.
5. Analyze the Social and Financial impact of Open source technology on Governance, Teaching and Business
6. Practice Open Source principles, ethics and models.

UNIT - I

Introduction to Open Source: Open Source, need of Open Source, Open Source Principles, Open Source Standards Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Software Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT - II

Fault Tolerant Design: Principles and Open Source Methodology- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copyleft, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT - III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT - IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, What Is A License, How to create your own Licenses. Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. KailashVadera, Bjhavesh Gandhi “Open Source Technology”, University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, “Open Source Technology and Policy”, Cambridge University Press.

Suggested Reading:

1. Wale Soyinka, “Linux Administration- A beginner‟s Guide”, Tata McGraw Hills.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing”, O'Reilly Media.
3. Dan Woods, Gautam Guliani, “Open Source for the Enterprise”, O'Reilly Media.
4. Bernard Golden, “Succeeding with Open Source”, Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, “Perspectives on Free and Open Source Software”, MIT press

Online Resources:

1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

20CSO05

BASICS OF ARTIFICIAL INTELLIGENCE
(Open Elective)

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 fundamental concepts in Artificial Intelligence.
2. To explore various paradigms involved in solving AI problems involving perception, reasoning and learning.
3. To apply AI concepts for building an expert system to solve the real-world problems.

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

1. Differentiate between a rudimentary Problem and an AI problem, its Characteristics and problem-solving Techniques.
2. Compare and contrast the various knowledge representation schemes of AI.
3. Appraise knowledge in Uncertainty and Probabilistic reasoning approaches.
4. Understand the different learning techniques.
5. Apply the AI techniques to solve the real-world problems.

UNIT - I

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of Al, Applications. **Problem Solving - State - Space Search and Control Strategies:** Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction.

UNIT - II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - III

Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster - Shafer Theory.

UNIT - IV

Intelligent Agents: Agents vs Software programs, classification of agents, Multi- agent systems, Architecture of intelligent agents, Multi-agent application.

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools.

UNIT - V

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines

Text Books:

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 3rd Edition, Prentice Hall.

Suggested Reading:

1. Rich, Knight, Nair, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition, 2009.
2. Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.

Online Resources:

1. https://nptel.ac.in/courses/106105077
2. https://nptel.ac.in/courses/106106126

20CSO06

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY
(Open Elective)

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 provide the basic concepts and architecture of Blockchain.
2. To interpret the working of Ethereum and Hyperledger Fabric.
3. To explore the applications of Blockchain in financial and government sectors.

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

1. Understand the concepts of distributed systems and Blockchain properties.
2. Learn about the significance of bitcoin ecosystem.
3. Understand consensus mechanisms and technologies that support ethereum.
4. Learn about Hyperledger Fabric and its architecture.
5. Analyze blockchain use cases in financial software systems and government sectors.

UNIT - I

Introduction: Overview of distributed systems; Introduction to Blockchain; Properties of Blockchain; Evolution of Blockchain.

Cryptocurrency and Block chain: Anonymity and Pseudonymity in Cryptocurrency; Programmable Money; Hash Functions and Merkle Trees; Components of Blockchain Ecosystem; Cryptography and Consensus Algorithms; Types of Blockchain; Blockchain Platforms.

UNIT - II

Bitcoin Platform: Bitcoin and its uses; Bitcoin Ecosystem; Structure of a Bitcoin Transaction; Nodes in a Bitcoin Network; Bitcoin Mining, Bitcoin Economics; Types of bitcoin Mining; Consensus mechanism in bitcoin.

UNIT - III

Introduction to Ethereum: What is Ethereum; Introducing Smart Contracts; Cryptocurrency in Ethereum; Mining in Ethereum; Consensus mechanism in Ethereum; Technologies that support Ethereum; Ethereum Programming Language; Ethereum Test Networks.

UNIT - IV

Hyperledger Fabric: Introduction to Hyperledger Fabric; Hyperledger Fabric architecture; Consensus in Hyperledger Fabric; Hyperledger API and Application Model; Setting up Development Environment using Hyperledger Composer tool.

UNIT - V

Blockchain in Financial Software Systems (FSS): Settlements, KYC; **Blockchain for Government:** Digital identity, land records and other kinds of record keeping between government entities.

Text Books:

1. Andreas M. Antonopoulos, “Mastering Bitcoin. Programming the Open Blockchain”, O’Reilly, 2017.
2. Ghassan Karame, Elli Androulaki, “Bitcoin and Blockchain Security”, Artech House, 2016.
3. Vikram Dhillon, “Blockchain Enabled Applications”, et al, Apress, 2019.

Suggested Reading:

1. Mark Gates, “Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates, 2017.
2. Melanie Swan, “Blockchain “, O’Reilly Media Inc., 2015.

Online Resources:

1. Blockchain Applications- https://www.blockchain-books.com
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric

3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, DavidSmits, 2017. (https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html)
4. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
5. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

20CSO07

FUNDAMENTALS OF SOFTWARE ENGINEERING
(Open Elective)

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,
1. To learn the fundamental concepts in software development.
2. To impart knowledge on various phases of software development.
3. To impart knowledge on software testing strategies and quality assurance activities.

Course Outcomes: On Successful completion of this course, student will be able to,
1. State the software process and the perspective process models and agile process models.
2. Interpret the Requirements of Software Product and demonstrate the skills necessary to specify the requirements of software product.
3. Recall the software architecture and design principles of software product.
4. Construct a product using coding principles and Outline the testing strategies for conventional and O-O Software.
5. Apply software testing methods like White Box, Black box and explore the corrective, adaptive, and enhancive software maintenance categories.

UNIT - I

The Software Problem, Software Processes- Process and Project, Components of software Processes. **Software Development Process Models**: Waterfall, Prototyping, Iterative Development, RUP, Time Boxing Model.
Agile Process: Agility, Agile Process Model – Extreme Programming, Using Process Models in a Project.

UNIT - II

Software Requirements Analysis Specification: Value of a Good SRS, Requirements Process, Requirements Specification, Functional Specification with Use-cases, other approaches for Analysis- DFD, E-R. **Planning a Software Project**: Project schedule and staffing, Quality Planning, Risk Management Planning, Project Monitoring Planning.

UNIT - III

Software Architecture: Architecture views, Component and Connector views, Architecture Styles for C&C views. Design: Design Concepts, Function Oriented Design, Object Oriented Design, Detailed Design.

UNIT - IV

Coding: Programming Principles and Guidelines, Incrementally developing code, Managing Evolving code, Code Inspection. **Testing Strategies**: A Strategic approach to software testing, strategic issues, test strategies for Conventional and O-O Software, Validation Testing, System Testing.

UNIT - V

Testing Tactics: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing. Black Box Testing. **Software Maintenance**: Categories of Maintenance.

Text Books:
1. Pankaj Jalote, “A concise introduction to software Engineering”, Springer, 2008.
2. Roger S.Pressman, “Software Engineering: A Practitioner’s Approach”, 7th Edition, McGraw Hill, 2009.
3. Nasib Singh Gill, “Software Engineering”, Khanna Publishing House, 2007.

Suggested Reading:
1. Roger S.Pressman, “Software Engineering: A Practitioner’s Approach”, 7th Edition, McGraw Hill, 2009.
2. Ali Behforooz and Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford University Press, 1996.

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

20CSO08

BASICS OF MACHINE LEARNING
(Open Elective)

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 Machine Learning algorithms.
2. To learn to work with data's, preparing datasets for real world problems
3. To study various machine learning algorithms.
4. To analyze data using machine learning techniques.
5. To become familiar with usage of time series and deep learning approaches.

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

1. Define the basic concepts related to Python and Machine Learning
2. Describe the feature engineering methods, regression techniques and classification methods
3. Apply Python packages for data visualization, text and time series data analysis using NLP toolkit
4. Evaluate and interpret the results of the various machine learning techniques
5. Solve real world problems using deep learning framework.

UNIT - I

Introduction to Machine Learning: Introduction, types of learning, Machine Learning process.
Introduction to Python: Features, sources and installation of Python, IDEs, Basics of Python, Data Structures and loops.

UNIT - II

Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python. Principal component analysis (PCA).
Data Visualization: Various charts, histograms, plots.

UNIT - III

Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression, Lasso regression, non-parameter regression.
Classification: Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes, Support Vector Machines (SVM).

UNIT - IV

Unsupervised Learning: Clustering, types of clustering, K-Means clustering, Hierarchical clustering.
Text Analysis: Basic text analysis with Python, regular expressions, NLP, text classification.
Time Series Analysis: Date and time handling, window functions, correlation, time series forecasting

UNIT - V

Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework.
Recommender System: Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018.
2. Tom Mitchel "Machine Learning", Tata McGraw Hill, 2017.

Suggested Reading:

1. Marsland, S. "Machine Learning: An Algorithmic Perspective" 1st Edition, Chapman and Hall/CRC, 2009. https://doi.org/10.1201/9781420067194
2. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017.

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/

20CSO09

FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS
(Open Elective)

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 data models, conceptualize and depict a database system using E-R diagrams.
2. To understand the internal storage structures in a physical DB design.
3. To learn the fundamental concepts of transaction processing techniques.

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

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS. Design the database logically using ER modeling
2. Outline the schema of the relational database and key constraints. Develop queries using DDL, DML and DCL of SQL.
3. Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense, sparse, ISAM and B+ tree indexing and get familiar with states and properties of transactions.
5. Interpret the locking, time stamp, graph and validation-based protocols for concurrency control.
6. Summarize log-based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions.

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures.
Database Design and E-R Model: Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys.
Structured Query Language: Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT - III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization – 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

UNIT - IV

Indexing: Basic concepts, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files.
Transaction Management: Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Serializability, Recoverability.

UNIT - V

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols.
Deadlocks Handling: Deadlock Prevention, Deadlock Detection and Recovery.
Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, “Database System Concepts”, Sixth Edition, McGraw-Hill International Edition, 2011.

2. Date CJ, Kannan A, Swamynathan S, “An Introduction to Database Systems”, Eight Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, JohnnesGehrke, “Database Management Systems”, Third Edition, McGraw Hill, 2003.
2. RamezElmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, “Fundamentals of Database Systems”, Fourth Edition, Pearson Education, 2006.

20CSO10

BASICS OF CYBER SECURITY
(Open Elective)

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,

1. To understand how to identify, analyze and remediate computer security breaches by learning and implementing the real-world scenarios in Cyber Investigations
2. To exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an organization.
3. To practice with an expertise in academics to design and implement security solutions.
4. To understand key terms and concepts in Cryptography, Governance and Compliance and Develop cyber security strategies and policies.
5. To understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools.

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

1. Analyze and evaluate the cyber security needs of an organization.
2. Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
3. Measure the performance and troubleshoot cyber security systems.
4. Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
5. Applying operational and cyber security strategies and policies.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An IndianPerspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber offenses: How Criminals Plan Them · Introduction · How Criminals Plan the Attacks · Social Engineering · Cyber stalking · Cybercafé and Cybercrimes. Cloud Computing Cybercrime: Mobile and WirelessDevices · Introduction · Proliferation of Mobile and Wireless Devices · Trends in Mobility · Credit Card Fraudsin Mobile and Wireless Computing Era ·

UNIT - III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors.
Steganography · DoS and DDoS Attacks · SQL Injection · Buffer Overflow · Attacks on Wireless Networks Phishing and Identity Theft · Introduction · Phishing · Identity Theft (ID Theft) Cybercrimes and Cybersecurity:The Legal Perspectives.

UNIT - IV

Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT – V

Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics. Introduction · Cost of Cybercrimes and IPR Issues: Lessons for Organizations · Web Threats for Organizations: The Evils and Perils.

Text Books:

1. Sunit Belapure Nina gobole, “Cyber Security”, Wiley, 2011.
2. Lester Evans, “Cyber security: An Essential Guide to Computer and Cyber Security for Beginners”, Bravex Publications, 2020.

Suggested Reading:

1. Prof Amit Garg, Dr Krishan Kumar Goyal, “Cyber Security”, Laxmi Publications, 2022.
2. Zach Codings, “Cyber Security: Hacking with Kali Linux, Ethical Hacking”, 2019.
3. Noah Zhang, Dana Onyshko, “Cyber Security: The Beginners Guide to Learning the Basics of Information Security and Modern Cyber Threats”, Kindle Edition.

Online Resources:

1. https://nptel.ac.in/courses/106106129
2. https://uou.ac.in/foundation-course
3. https://nptel.ac.in/courses/106105162

20CSO11

DATA VISUALIZATION MODELS
(Open Elective)

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 various types of data.
2. To acquire the knowledge on Non-spatial and spatial data visualization
3. To understand visualization fundamentals and web data visualization.

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

1. Illustrate the modeling of various types of data.
2. Understand the visualization fundamentals.
3. Apply methods and tools for Non – spatial Data Visualization.
4. Apply methods for spatial data visualization.
5. Apply methods for web data visualization.

UNIT - I

Data Modeling: Conceptual models, Spread sheet models, Relational Data Models, object oriented models, semi structured data models, unstructured data models.

UNIT - II

Visualization Fundamentals, Design principles, The Process of Visualization, Data Abstraction, Visual Encodings, Use of Color, Perceptual Issues, Designing Views, Interacting with Visualizations, Filtering and Aggregation, Design Studies Information.

UNIT - III

Non-Spatial Data Visualization, Tabular Data, Tree Data, Graph Data, Text Data, Flow Data, Time-Series Data, Topological Visualization, Uncertainty, Visual Analytics.

UNIT - IV

Scientific /Spatial Data Visualization, Scalar Volumes, Isosurfacing, Volume Rendering, Transfer Function Design, Vector Fields, Maps, Spatial Uncertainty.

UNIT - V

Web data visualization: web structure data, web usage data, web content data multimedia data visualization.

Text Books:

1. Ben Fry, “Visualizing Data” O'Reilly Media, Inc., 2007.
2. Tamara Munzner, “Visualization Analysis and Design”, A K Peters/CRC Press, 2014.
3. Colin Ware, “Information Visualization: Perception for Design”, Morgan Kaufmann; 3rd edition, 2012.

Suggested Reading:

1. Paulraj Ponniah, “Data Modeling Fundamentals”, a Practical Guide for IT Professionals, Wiley-Inter science; 1st edition, 2007.

Online Resources:

1. https://www.coursera.org/learn/datavisualization/home/welcome
2. https://www.coursera.org/learn/data-visualization-tableau/home/welcome
3. https://www.udemy.com/course/learning-python-for-data-analysis-and-visualization/learn/lecture/2345238?start=0#overview
4. https://onlinecourses.nptel.ac.in/noc16_cs03/preview

20CSO12

INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT
(Open Elective)

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 the fundamentals of Android operating systems.
2. To apply skills using Android software development tools.
3. To be able to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of this 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 android 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.

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.

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.

20CSO13

BASICS OF CLOUD COMPUTING
(Open Elective)

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 understand the concept of cloud computing.
2. To appreciate the evolution of the cloud from the existing technologies.
3. To have knowledge of the various issues in cloud computing.
4. To be familiar with the lead players in the cloud.
5. To appreciate the emergence of the cloud as the next-generation computing paradigm.

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

1. Define the main concepts, key technologies, strengths, and limitations of cloud computing.
2. Develop the ability to understand and use compute and storage cloud architecture, service, and delivery models.
3. Understanding the virtualization and enabling technologies that help develop the cloud.
4. Explain the core issues of cloud computing such as resource management and security.
5. Evaluate and choose the appropriate technologies, and approaches for implementing and using the cloud.

UNIT - I

Introduction To Cloud: Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing -Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT - II

Cloud Architecture and Services: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges

UNIT - III

Virtualization: Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU -Memory – I/O Devices – Virtualization Support and Disaster Recovery.

UNIT - IV

Resource Management and Security in Cloud: InterCloud Resource Management – Resource Provisioning and Resource Provisioning Methods– Cloud Security Challenges –Software-as-a-Service Security – Security Governance – Virtual Machine Security

UNIT - V

Cloud Technologies and Advancements: Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation –Federated Services and Applications – Future of Federation.

Test Books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome,"Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
3. Jaden Locus "**cl**oud Computing for Beginners with Examples", Kindle Edition, 2019.

Suggested Reading:

1. Lisdorf, Anders "Cloud computing Basics: A Non-Technical Introduction" published 2021.
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013.

3. Thomas Erl and Zaigham Mohamood “Cloud Computing: Concepts, Technology & Architecture”, The Pearson Service Technology Series, published 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata McGraw Hill, 2009.

Online Resources:

1. https://1library.net/document/ozl74rry-mastering-cloud-computing-rajkumar-buyya-pdf.html
2. Mastering Cloud Computing Rajkumar Buyya pdf (1library.net)
3. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things by Kai Hwang (goodreads.com)
4. https://www.goodreads.com/book/show/19649262-distributed-and-cloud-computing

20CSO14

FUNDAMENTALS OF COMPUTER VISION
(Open Elective)

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

Course Objectives: The objectives of this course are,
1. To understand the Fundamental Concepts Related to Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of this course, student will be able to,
1. Recognize the basic fundamentals of vision and describe the scope of challenges.
2. Develop algorithms to analyze feature detection and feature alignment.
3. Analyze images and videos for problems such as tracking and structure from motion.
4. Choose object, scene recognition and categorization algorithms for real time images.
5. Apply various techniques to build computer vision applications.

UNIT - I

Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation.
Image Processing: Point operators, linear filtering, more neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT - II

Feature detection and matching: Points and patches, Edges, Lines.
Segmentation: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts.
Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation.

UNIT - III

Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion.
Dense motion estimation: Translational alignment, parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT - IV

Image Stitching: Motion Models, Global alignment, Sparse and dense corresponding, Global Optimization.

UNIT – V

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

Text Books:
1. Richard Szeliski “Computer Vision: Algorithms and Applications”, Springer-Verlag London Limited, 2011.
2. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”; Addison Wesley, 2008.

Suggested Reading:
1. Robert J. Schallkoff, “Pattern Recognition: Statistical. Structural and Neural Approaches”, John Wiley and Sons; 1992+.
2. D. A. Forsyth and J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
3. R. Hartley and A. Zisserman, “Multiple View geometry”, Cambridge University Press, 2002.
4. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; “Introduction to Statistical Pattern Recognition”, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources / Weblinks / NPTEL Courses:

1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage:
3. http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html