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
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

(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. (CSE - Artificial Intelligence and Machine Learning)

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.	20CAC08	Cloud Technologies	3	-	-	3	40	60	3
2.		Professional Elective-IV	3	-	-	3	40	60	3
3.		Open Elective-III	3	-	-	3	40	60	3
4.	20EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	No Credits
5.	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	No Credits
PRACTICAL									
6.		Professional Elective-IV Lab	-	-	2	3	50	50	1
7.	20CAC09	Technical Seminar	-	-	2	-	50	-	1
8.	20CAC10	Project Part- 1	-	-	4	-	50	-	2
9.	20CAI03	Internship-III	5-6 weeks / 135 hours			-	50	-	3
		TOTAL	**13**	**-**	**8**	**-**	**320**	**330**	**16**

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Professional Elective – IV	
20CSE10	Devops
20CSE37	High Performance Computing
20CSE36	Cyber Security
20CSE08	Enterprise Application Development
20CAE08	Big Data Frameworks

Professional Elective – IV Lab	
20CSE19	Devops Lab
20CSE40	High Performance Computing Lab
20CSE39	Cyber Security Lab
20CSE17	Enterprise Application Development Lab
20CAE13	Big Data Frameworks Lab

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

20CAC08

CLOUD TECHNOLOGIES

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 cloud from the existing technologies.
3. To have knowledge on issues in the 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, technologies, strengths, and limitations of cloud computing.
2. Identify the key and enabling technologies that help in the development of the cloud.
3. Develop the ability to understand and use the architecture of compute, cloud storage, service and delivery models.
4. Explain the core issues of cloud computing such as resource management and security.
5. Evaluate and choose the appropriate technologies, and approaches for implementation, and use of 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 Enabling Technologies : Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model – 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-III: Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT-IV: Resource Management and Security in Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods– Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges –Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM –Security Standards.

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.

Text 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 " year of publication 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.

20CSE10

DEVOPS
(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, Operating systems, OOPs.

Course Objectives: The objectives of this course are,

1. To describe the agile relationship between development and IT operations.
2. To understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. To implement automated system update and DevOps lifecycle.

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

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tools.
4. Investigate different DevOps Software development models.
5. Assess various Devops practices.
6. Collaborate and adopt Devops in real-time projects.

UNIT - I

Introduction: Software development models, Introduction to DevOps, Why DevOps, DevOps process and Continuous Delivery, Delivery pipeline, Release management, Scrum, Kanban DevOps Architecture, DevOps Workflow DevOps Lifecycle for Business Agility, and Continuous Testing.

UNIT - II

Introduction to project management: The need for source code control, the history of source code management, Git **- A version control tool**, Version Control System and Types, CVCS and DVCS
Git Essentials: Creating repository, Cloning, check-in and committing, Fetch pull and remote, Branching

UNIT - III

Jenkins - Continuous integration: Introduction to Continuous Integration, Build & Release and relation with DevOps Why continuous integration, Nodes/Salves, Managing plugins, Managing Software Versions.
Build Tools: Overview of Maven, Virtualization, and Virtualization in DevOps Understand Containers Dockers - A containerization technology

UNIT - IV

Testing Tools and automation: Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium -Introduction, Selenium features, Testing backend integration points, Test-driven development, REPL-driven development.
Deployment Tools: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack

UNIT - V

Code monitoring and Issue Tracking: Code monitoring tools Nagios, Munin, Ganglia, Log handling.
Introduction to issue trackers, Need of issue tracker: Workflows and issues.
Trackers tools: Bugzilla, GitLab tracker, and Jira.

Text Books:

1. Joakim Verona. “Practical Devops”, Second Edition. Ingram short title; 2nd edition, 2018.
2. Deepak Gaikwad, Viral Thakkar, “DevOps Tools from Practitioner's Viewpoint”. Wiley publications, 2019.

Suggested Reading:

1. Len Bass, Ingo Weber, Liming Zhu, “DevOps: A Software Architect's Perspective”. Addison Wesley, 1st Edition, 2015.

Online Resources:

1. https://www.coursera.org/learn/intro-to-devops
2. hhttps://www.tutorialspoint.com/introduction-to-devops/index.asp

20CSE37

HIGH PERFORMANCE COMPUTING
(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: 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

20CSE36

CYBER SECURITY
(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: 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

20CSE08

ENTERPRISE 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: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To provide good understanding of latest web technologies on client side components like ReactJS and Angular2
2. To acquire knowledge on web frameworks, develop server side web applications like Node.js and Express
3. To develop innovative web applications using various technologies.

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

1. Understand the database connectivity and application servers.
2. Explore the type of forms with validations using ReactJS.
3. Utilize Express framework to develop responsive web applications.
4. Demonstrate the architecture and file system of NodeJs.
5. Identify the significance of component intercommunication with Angular2.
6. Adapt MEAN or MERN stack to implement a real-time web application.

UNIT - I

Introduction to Full stack development and NoSQL

MongoDB: Basics, Configuring Server and Client, MongoDB Compass, Creating Database, MongoDB Commands, MongoDB CRUD Operations.

REST: Introduction to REST and API, REST Constraints, Representations, Resource Identifier, REST Actions, Status Codes.

UNIT - II

NodeJs: Introduction, NodeJS Features and Drawbacks, setup Environment for NodeJs, NodeJS Program architecture, NodeJS Web Server, NodeJS Global Objects, NodeJS OS Objects, NodeJS Error Handling, Node JS Event Loop, NodeJS File System, Async and Sync, Connecting with Database, Handling CRUD Operations.

UNIT - III

Building an Express web application: Introduction to Express, Installation of Express, Create first Express application, the application request and response objects, configuring an Express application, rendering views, Authentication, Authorization.

UNIT - IV

Introduction to ReactJS: React Components, React State and Props

Component intercommunication: Component Composition, pass data from parent to child, pass data from child to parent, Fetching data API using axioms, Types of forms, Form Validations, Posting Data, React Router, Building & Deploying React App.

UNIT - V

Introduction to Angular2: Angular2 Architecture (Component-Based Architecture), Consuming API, State Management, Validation, Routing. Passing data from parent to child and Passing data between siblings.

Angular2 Specific: Directives, Modules, Components, Observables, Binding, Pipes, Dependency Injection.

Text Books:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016.
2. Vasan Subramanian, “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node”, 2nd Edition, APress.
3. Fernando Doglio, “REST API Development with Node.js”, 2nd Edition, APress.

Suggested Reading:

1. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O'REILLY, 2016.
2. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019
3. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. https://www.mongodbtutorial.org/mongodb-crud/
2. https://reactjs.org/tutorial/tutorial.html
3. https://www.javatpoint.com/expressjs-tutorial
4. https://www.javatpoint.com/nodejs-tutorial
5. https://angular-training-guide.rangle.io/

20CAE08

BIG DATA FRAMEWORKS
(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 System, OOP's, Web and Internet Technologies, Operating Systems

Course Objectives: The objectives of this course are to,

1. Understand the significance of bigdata and its associated technologies.
2. Explore hadoop framework and map reduce programming.
3. Understand the significance of Apache Spark.
4. Analyze various NoSQL databases.
5. Implement real world applications using MongoDB.

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

1. Understand the significance of bigdata and frameworks associated with it.
2. Deploy hadoop framework and map reduce programming
3. Understand the significance of Apache Spark.
4. Analyze various NoSQL databases, their characteristics and challenges.
5. Implement real world applications using NoSQL databases such as MongoDB.

UNIT-I : Introduction to Bigdata: What is Bigdata, Impact of Bigdata, Characteristics of bigdata, Parallel Processing, Scaling, and Data Parallelism, Bigdata Tools, Big Data Analytics, Challenges in Big Data Analytics, Need for big data frameworks, Big Data Use Cases.

UNIT-II : Hadoop Ecosystem: Introduction to Hadoop, Hadoop Components, Map Reduce, Hadoop Ecosystem : HDFS architecture, Design Concepts, Hive- modules, Data types and file formats, YARN, Sqoop, HBase, PIG, Zookeeper.

UNIT-III : Apache Spark: Significance of Apache Spark, Resilient Distributed Datasets, Apache Spark architecture, Data Parallelism, Dataframes, Spark Streaming, SparkSQL, Spark Applications.

UNIT-IV : NoSQL Databases: Overview of NoSQL, Characteristics of NoSQL Databases, NoSQL Database Categories, Distributed Databases, The CAP Theorem, Challenges in Migrating from RDBMS to NoSQL Databases.

UNIT-V : NoSQL Implementation: overview of MongoDB, Advantages of MongoDB, CRUD Operations, Indexes, Aggregation Framework, Replication & Sharding, Use Cases for MongoDB.

Textbooks:

1. TomWhite,"Hadoop:TheDefinitiveGuide",O'Reilly,4th Edition,2015.
2. Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.
3. Mohammed Guller, Big Data Analytics with Spark, Apress,2015.
4. Next Generation database: NoSQL and big data by Guy Harrison.

Suggested Reading:

1. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012.
2. Nick Pentreath, Machine Learning with Spark, Packt Publishing,2015.Online Resources:

Online Resources:

1. https://www.edx.org/course/big-data-hadoop-and-spark-basic
2. https://www.coursera.org/specializations/nosql-big-data-and-spark-foundations#courses

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	No 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: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. Indian Government & Politics, Ed Prof V Ravindra Sastry, 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 Edn., 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

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	-
Credits	No Credits

Prerequisite: Knowledge on Indian Culture

Course Objectives: The objectives of this course are

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

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

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II

Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III

Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV

Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V

Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Text Books:

1. Kapil Kapoor, “Text and Interpretation: The Indian Tradition”, ISBN: 81246033375, 2005
2. Samskrita Bharati, “Science in Samskrit”, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, “Founders of sciences in Ancient India”, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, “The Positive Sciences of the Ancient Hindus”, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, “Turning the Pot, Tilling the Land: Dignity of Labour in Our Times”

Suggested Reading:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, Advaita Ashrama, Kolkata 9788185301860

6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

Online Resources:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

20CSE19

DEVOPS 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, Operating systems, OOPs.

Course Objectives: The objectives of this course are,

1. To explore the fundamental concepts in Project Life Cycle.
2. To develop skills using tools of DevOps.
3. To examine the application development with different automation tools.

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

1. Understand the phases of the software development life cycle.
2. Examine the different version control systems.
3. Recognize the importance of the build and deployment tools and test the software application.
4. Deployment of application in production environment.
5. Summaries the software configuration management.
6. Synchronize and provisioning using Puppet and Ansible.

List of Experiments:

1. Git installation and create a repository and perform fetch, pull, branching operations.
2. Jenkins Installation and implement continues Integration and Continues deployment, build a job using Jenkins.
3. To install and configure Docker for creating containers of different Operating System (Virtualization Concept)
4. Deployment Tool (Team City /Ansible) Install Docker and execute commands in a Docker and deploy the application in to Docker file
5. Test the Application using selenium tool.
6. Configuring and establish Connection between Agent and Master using Puppet
7. Install code monitoring tools ex: Nagios..Perform operations
8. Install issue tracker and monitor the workflow of any application and track the issues JIRA tool (Agile management tool)

Text Books:

1. Joakim Verona. “Practical Devops”, Second Edition. Ingram short title; 2nd edition, 2018.
2. Deepak Gaikwad, Viral Thakkar, “DevOps Tools from Practitioner's Viewpoint”. Wiley publications, 2019.

Suggested Reading:

1. Len Bass, Ingo Weber, Liming Zhu, “DevOps: A Software Architect's Perspective”. Addison Wesley, 1st Edition, 2015.

Online Resources:

1. https://www.coursera.org/learn/intro-to-devops
2. https://www.tutorialspoint.com/introduction-to-devops/index.asp

20CSE40

HIGH PERFORMANCE COMPUTING 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

Course Objectives: The objectives of this course are to

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

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

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

LIST OF EXPERIMENTS:

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

Text Books:

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

Online Resources:

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

20CSE39`

CYBER SECURITY 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: Basic Computer Knowledge

Course Objectives: The objectives of this course are

1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To identify the security issues and vulnerabilities.

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

1. Identify the Foot Printing Tools for Information Gathering.
2. Explore the Tools for scanning and scrutinizing the gathered information .
3. Demonstrate the usage of Sniffer Tools.
4. Examine Attack Launching Tools.
5. Analyze the security issues and vulnerability in Email system.

List of Experiments:

1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Foot printing, Social Network Foot printing, Email Foot printing).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Identification of Virus infected file using virustotal.com
8. Analysis of security vulnerabilities of Email Application
9. Case Study on Ransomware.
10. Case Study on Cyber Attack/ Cyber Crime.

Textbooks:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd, 2011.
2. Zoom, “Cyber Security Professional Lab Manual”.
3. Dr. Eric cole, Dr. Ronald Krutz and James W. Conley, “ Network Security Bible”, Edition 2, Wiley India Pvt. Ltd, 2010.

Online Resources:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

20CSE17

ENTERPRISE 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: Internet and web technologies, OOPs, Database management systems.

Course Objectives: The objectives of this course are,

1. To acquire knowledge on MongoDB, ReactJS, Express, Node.js and Angular2 to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

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

1. Prepare database connections with application servers.
2. Design user interfaces using ReactJS.
3. Construct strong expertise on Express framework to develop responsive web applications.
4. Create server side applications using Node.js
5. Develop SPA using Angular 2.
6. Invent next culture-shifting web applications.

List of Programs:

1. Installation, configuration and connection establishment of MongoDB.
2. CRUD operations on MongoDB.
3. Building and Deploying React App.
4. Demonstration of component intercommunication using ReactJS
5. Create Express application,
6. Demonstration of authentication and authorization using Express.
7. Data access using Node.js
8. Create a form to edit the data using Angular2
9. A case study on a single platform for all financial data for NSE India.

Textbook:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016
2. Vasan Subramanian, “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node”, 2nd Edition, APress.

Suggested Reading:

1. Shelly Powers, “Learning Node: Moving to the Server-Side”, 2nd Edition, O’REILLY, 2016.
2. Simon D. Holmes and Clive Harber, “Getting MEAN with Mongo, Express, Angular, and Node”, Second Edition, Manning Publications, 2019.
3. Brad Dayley, “Node.js, MongoDB and Angular Web Development”, 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. https://www.mongodbtutorial.org/mongodb-crud/
2. https://reactjs.org/tutorial/tutorial.html
3. https://www.javatpoint.com/expressjs-tutorial
4. https://www.javatpoint.com/nodejs-tutorial
5. https://angular-training-guide.rangle.io/

20CAE13

BIG DATA FRAMEWORKS 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

Course Objectives: The objectives of this course are to,

1. Understand the significance of bigdata and its associated technologies.
2. Explore hadoop framework and map reduce programming.
3. Understand the significance of Apache Spark.
4. Analyse various NoSQL databases.
5. Implement real world applications using MongoDB.

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

1. Understand the significance of bigdata and frameworks associated with it.
2. Implement real-world use cases through hadoop framework.
3. Implement Map reduce programming model.
4. Deploy Sqoop and Hive queries.
5. Deploy Apache Spark and Apache SQL functionalities.
6. Implement real world applications using NoSQL databases such as MongoDB.

List of Programs:

1. Configure Apache Hadoop: Installing Java, Installing Hadoop.
2. Store the Data into HDFS and read the Data from HDFS using CLI commands (Hadoop FS shell).
3. Learning and analyzing basic MapReduce API Concepts.
4. Implementaiton of MapReduce Driver, Mappers, and Reducers.
5. Sqoop Installation and configuration, importing data from RDBMS to HDFS.
6. Execute basic Hive queries.
7. Install Spark and execute the basic jobs on it.
8. Perform CRUD operations through SparkSQL.
9. Installation of MongoDB and GUI of MongoDB.
10. Create, Update, and Delete Documents.
11. A Case study to carry out real-time data analytics using the above implemented technologies and assess the effectiveness using any suitable performance metrics.

Textbooks:

1. Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools by Deepak Vohra
2. MongoDB The Definitive Guide, O' Reilly by Christina Chodrow

Suggested Reading:

1. Big Data and Hadoop: Learn by Example by Mayank Bhushan
2. Mastering MongoDB by Alex Giamas, Publisher: Packt

Online Resources:

1. https://cloudxlab.com/course/67/big-data-engineering-with-hadoop-and-spark
2. https://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html

20CAC09

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		
Sno.	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

20CAC10

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

20CAI03

INTERNSHIP - III

Instruction	5-6 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. (CSE - Artificial Intelligence and Machine Learning)

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.		Professional Elective-V	3	-	-	3	40	60	3
2.	20CEM01	Environmental Science	2	-	-	2	-	50	No Credits
3.	20EGM04	Gender sensitization	2	-	-	2	-	50	No Credits
PRACTICAL									
4.	20CAC11	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 – V	
20CAE09	Planning and estimation of Autonomous Systems
20CAE10	Computational Neuroscience
20CSE35	Augmented Reality and Virtual Reality
20CAE11	Network and System Administration
20CAE12	Parallel Computing

20CAE09

PLANNING AND ESTIMATION OF AUTONOMOUS 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: 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 different techniques for 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, 5, 6. 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

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 and 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: The Student 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. Analyze 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

20CSE35

AUGMENTED REALITY AND VIRTUAL REALITY
(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, 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 & VR systems.
3. Apply technical and creative approaches to make successful applications and experiences.
4. Design audio and video interaction paradigms.
5. Understand AR&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

20CAE11

NETWORK AND SYSTEM ADMINISTRATION
(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

Course Objectives: The objectives of this course are to,

1. Understand the basic system and network administration tools and commands.
2. Familiarize the students with system and network administration.
3. Analyse the system and network performance, troubleshoot issues

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

1. Identify and examine the system and networking administration tools and commands
2. Describe different addressing and configure DHCP server
3. Configure various services like mail, ftp, web hosting, and security, and use remote administration tools
4. Analyze the DNS server and illustrate the web and proxy server
5. Evaluate and configure the User and system security tools
6. Write scripts to automate the system administration process

UNIT – I : Networking Overview: Protocol standards, Reference Models (ISO-OSI, TCP/IP), Networking basics of Windows and Linux, switching and routing basics Server Administration Basics: Server and Client Installation, boot process and startup Services: Xinetd, Managing user and group accounts, File Systems and Quota Management , Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, online server updation process.

UNIT – II : Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Network troubleshooting commands Dynamic Host Configuration Protocol (DHCP), DHCP Principle, DHCP Server Configuration, DHCP Options, Scope, Reservation and Relaying and troubleshooting

UNIT – III : Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic updates, delegation, DNS Server Security, Troubleshooting
Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting

UNIT – IV : FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting
Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering

UNIT – V : Network Security and User Management: Router Configuration, webmin/usermin, Introduction to pfSense; Firewall: Interfaces, VIPs, and Rules; Failover and Load balancer, Remote connectivity

Textbooks:

1. Jay LaCroix,"Mastering Linux Network Administration", Packt Publishing, 2015
2. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, “The Practice of System and Network Administration”, Pearson Education, Second Edition, 2012

Suggested Reading:

1. Tony Bautts, Terry Dawson, Gregor N. Purdy, “Linux Network Administrator's Guide”, O‟Reilly Publisher, Third Edition, 2005
2. Michael W Lucas, "Networking for Systems Administrators: 5 (It Mastery)",Tilted Windmill Press, 2019.
3. Manuj Aggarwal, "Network Security with PfSense", Packt Publishing, 2018

Online Resources:

1. https://nptel.ac.in/courses/106105183
2. https://www.coursera.org/learn/system-administration-it-infrastructure-services

20CAE11

PARALLEL 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

Course Objectives: The objectives of this course are,

1. To acquaint with the basic concepts of parallel and distributed computing.
2. To provide knowledge of parallel computing platforms.
3. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
4. To equip with modern parallel and distributed approaches for solving problems in emerging applications.

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

1. Describe the models and techniques for parallelization.
2. Make use of list ranking and graph coloring parallel Algorithms.
3. Analyze parallel algorithms and compute their complexity measures.
4. Develop parallel programs for search and matrix multiplication using open MP.
5. Choose a parallel algorithm that makes good use of the target Architecture.
6. Describe the distributed Algorithms to learn its models and complexity measures.

UNIT – I: The Idea of Parallelism: A Parallelized version of the Sieve of Eratosthenes. PRAM Model of Parallel Computation. Pointer Jumping and Divide & Conquer: Useful Techniques for Parallelization.

UNIT – II: PRAM Algorithms: Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring, Reducing the Number of Processors and Brent's Theorem, Dichotomy of Parallel Computing Platforms, Cost of Communication, Programmer's view of modern multi-core processors.

UNIT – III: The role of compilers and writing efficient serial programs, Parallel Complexity: The P-Complete Class, Mapping and Scheduling, Elementary Parallel Algorithms for Sorting.

UNIT – IV: Parallel Programming Languages: Shared Memory Parallel Programming using OpenMP Writing efficient openMP programs, Dictionary Operations: Parallel Search, Graph, Algorithms and Matrix Multiplication.

UNIT – V: Distributed Algorithms: models and complexity measures. Safety, liveness, termination, logical time and event ordering, Global state and snapshot algorithms, Mutual exclusion and Clock Synchronization, Distributed Graph algorithms.

Textbooks:

1. Michael J Quinn, “Parallel Computing: Theory and practice”, Tata McGraw Hill, 1993.
2. Roman Trobec, Boštjan Slivnik, Patricio Bulić, Borut Robič, “Introduction to Parallel Computing”, Springer, 2018.
3. Joseph Jaja, “Introduction to Parallel Algorithms”, First Edition, Addison Wesley, 1992.

Suggested Reading:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, “Introduction to Parallel Computing”, Second Edition, Addison Wesley, 2003

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs17/preview
2. https://nptel.ac.in/courses/106102163/

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 the course, students 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.

Textbooks:

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

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

20CAC11

PROJECT:PART – 2

Instruction	8 Hours per week
Duration of End Examination	-
Semester End Examination	100 Marks
Continuous Internal Evaluation	100 Marks
Credits	4

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 p. 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: By the end of course, students 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