SCHEME OF INSTRUCTION AND SYLLABI (R-20)

OF

B.E. VII & VIII SEMESTER

IN

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to Osmania University

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

AICTE Model Curriculum with effect from AY 2023-24

B.E. (Artificial Intelligence &Machine Learning)

SEMESTER – VII

S. No	CourseCode	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Durationof SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	**20XXXX**	Professional Elective-IV	3	0	0	3	40	60	3
2	**20CIC07**	Theory of Computation & Compilers	3	0	0	3	40	60	3
3	**20AMCXX**	Engineering Leadership	1	0	0	3	40	60	1
4	**20XXXX**	Open Elective – II	2	1	0	3	40	60	3
5	**20EGM04**	Gender Sensitization	2	0	0	2	-	50	Non-Credit
6	**20EGM02**	Indian Traditional Knowledge	2	-	-	2	-	50	Non-Credit
PRACTICAL									
7	**20XXXX**	Professional Elective-IV	0	0	2	3	50	50	1
8	**20AMC16**	Capstone Project-I (Part 1)	0	0	4	3	50	-	2
9	**20AMI03**	Internship-III	5-6 Weeks/135 Hours				50	-	3
TOTAL			**13**	**1**	**6**	**22**	**310**	**410**	**16**

L: Lecture **T: TutorialP: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

S. No.	Profession Elective IV(T&L)		Open Elective – II
20AME05(T) & 20AME06(P)	Web Programming	**20ECO01**	Remote Sensing and GIS
20CAE08(T) & 20CAE13(P)	Big Data Frameworks	**20MTO01**	Financial Mathematics
20AME07(T) & 20AME08(L)	High Performance Computing	**20EEO02**	Energy Management Systems
20CSE10(T) & 20CSE19(L)	Devops	**20EGO01**	Technical Writing Skills
		20CEO02	Disaster Mitigation and Management

20AME05

WEB PROGRAMMING

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:

1. To provide knowledge about web pages design and development.
2. To understand how the HTML, CSS and JavaScript components of Bootstrap work.
3. To explore the basic architecture of a React application and develop applications in agile mode.
4. To gain the basics of frond-end and back-end application development using Nodejs.
S. To understand the basics of MongoDB and its Data Model.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Create static web pages using HTML,CSS, Bootstrap
2. Create interactive web pages using JS and React
3. Effectively use React JS frame work in web pages.
4. Build an end-to-end application from scratch using NODE JS and Express.
5. Understand and build logical relationships between documents using MongoDB.

UNIT-I

Introduction: Web Fundamentals, **HTML 5.0:** Basic tags, Images, Tables, Lists, Forms, Layout, Graphics, span and div tags.

Introduction to Cascading Style Sheets: Types of CSS, **text and font, color,** CSS Selectors, CSS BOX Model, CSS Positioning, and CSS floating, CSS Grid layout Module.

UNIT-II

Java Script: Data Types & Type Conversion, JSON, Events, String and Date Functions, Object Oriented Programming (OOP) in JS, Document Object Model, JavaScript Regular Expressions.

Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Connectivity of Bootstrap in page, Bootstrap Components.

React JS: Basics, State, Props, Components, Lifecycle, Events, Router, Forms, Tables, Portals, ES6, CSS, Hook, and Back End Integration.

UNIT-III

Node JS Modules: Functions, Buffer, Modules, Modules Types, Core Module, Local Modules and Modules Exports

Node Package Manager: What is NPM? Installing Packages Locally, installing package globally, adding dependency in package Json and Updating packages.

Creating Web Server: Creating Web Server, Sending Requests and Handling HTTP requests.

File System: Read File, writing a File, opening a File Deleting a File, Writing a file asynchronously and Other I/O Operations.

Events: Event Emitter class, Inheriting Events and Returning event emitter.

UNIT-IV

Express JS: The model-view-controller pattern, Defining EJS template Engine Building a front-end controller, defining routes, creating actions, Configuring Express to use EJS, Using REST, Reading POST data Adding middleware.

UNIT-V

Mongo DB: Introduction, Importance of NoSQL databases, JSON features, Data types and examples. CRUD Operations, Data Modelling & Schema Design, Indexing and Aggregation, Mongo Import/Export and Master/Slave Replication.

Teat Books:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge — “MongoDB Basics”, Apress, 2014.

Suggested Reading:

1. Ethan Brown, “Web Development with Node and Express”, Oreilly Publishers, First Edition, 2014.

Web Resources:

1. https://web.stanford.edu/class/csl42/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20 Edition.pdf

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 big data 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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	1	2	-	-	-	-	-	-	1			
CO 2	1	1	1	2	2	-	-	-	-	-	-	1			
CO 3	1	-	1	2	2	-	-	-	-	-	-	1			
CO 4	-	-	1	2	2	-	-	-	-	-	-	1			
CO 5	1	-	1	2	2	-	-	-	-	-	-	1			

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
   https://www.coursera.org/specializations/nosql-big-data-and-spark-foundations#courses

20AME07

High Performance Computing
(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	3

Course Outcomes

At the end of the course, students should have learned the following concepts:

- Understand computer systems, such as processor architecture, memory subsystem and caching, from a programmer's viewpoint to maximize performance of his/her application.
- Understand underlying Operating Systems concepts from a programmer's viewpoint, including process, memory and file system management.
- Understand parallel processing systems, from a programmer's viewpoint, and develop parallel programs.
- To Understand grid computing and cloud computing.

Collectively, these should help you design and develop high performance applications, and also improve applications' performance.

Unit I:*Introduction to Computer Systems*: Processors, Memory, I/O Devices; Cost, timing and scale (size) models; Program Execution: Process; Virtual Memory; System Calls; Dynamic Memory Allocation. Machine level view of a program; typical RISC instruction set and execution; Pipe lining. Performance issues and Techniques; Cost and frequency models for I/O, paging and caching. Temporal and spatial locality. Typical compiler optimizations. Identifying program bottlenecks - profiling, tracing.

Unit II :- ***Parallel computing***: Parallel Computing: Introduction to parallel architectures and interconnection networks, communication latencies. Program parallelization; task partitioning and mapping; data distribution; message passing; synchronization and deadlocks. Distributed memory programming using MPI/PVM. Shared memory parallel programming. Multi threading.

Unit III:Load Sharing and Balancing: Evolution, Job and Resource Management Systems, State-of-the-Art in RMS and Job, Rigid Jobs with Process Migration, Communication-Based Scheduling, Batch Scheduling, Fault Tolerance, Scheduling Problem for Network Computing, Algorithm - ISH, MCP and ETF, Dynamic Load Balancing, Mapping and Scheduling, Task Granularity and Partitioning, Static and Dynamic Scheduling.

Unit IV:-Grid Computing: Introduction to Grid Computing, Virtual Organizations, Architecture, Applications, Computational, Data, Desktop and Enterprise Grids, Data-intensive Applications, High-Performance Commodity Computing, High-Performance Schedulers, Grid Middleware: Connectivity, Resource and Collective Layer, Globus Toolkit, GSI, GRAM, LDAP, Grid Ftp, GIIS, Heterogeneous Computing Systems,

Unit V:-Cloud Computing: Introduction to Cloud Computing, Types: Deployment and Service Models, Characteristics, Applications, Service-Level Agreement, Virtualization, High-Throughput Computing: Task Computing and Task-based Application Models, Market-Based Managementof Clouds, Energy-Efficient and Green Cloud Computing Architecture, Resource Allocation, Leases, Task Scheduling: RR, CLS and CMMS.

Text Books

1. R. Buyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
2. (Edited By) I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.
3. D. Janakiram, Grid Computing, Tata McGraw-Hill, 2005.
4. R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and

Applications Programming, Morgan Kaufmann, Elsevier, 2013.

Reference Books

1. A. Chakrabarti, Grid Computing Security, Springer, 2007.
2. B. Wilkinson, Grid Computing: Techniques and Applications, CRC Press, 2009.
3. C. S. R. Prabhu, Grid and Cluster Computing, PHI, 2008.
4. B. Sosinsky, Cloud Computing Bible, Wiley, 2011.

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	3	2	2	2	1	2	2	2	2	1			
CO 2	2	2	3	2	2	1	1	2	3	2	2	2			
CO 3	1	1	3	2	3	2	-	2	2	2	1	1			
CO 4	2	2	2	3	3	1	-	2	3	2	1	-			
CO 5	1	2	2	2	3	2	1	2	2	2	2	2			
CO 6	2	2	3	3	3	1	2	2	2	2	1	-			

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

20CIC07

THEORY OF COMPUTATION AND COMPILERS

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

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

Course Objectives: The objectives of this course are to

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

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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	2	-	-	-	-	-	-	-	-			
CO 2	3	1	2	1	-	-	-	-	-	-	-	-			
CO 3	3	3	3	2	-	-	-	-	-	-	-	-			
CO 4	3	2	3	2	-	-	-	-	-	-	-	-			
CO 5	3	2	1	1	-	-	-	-	-	-	-	-			
CO 6	3	2	1	1	3	-	-	-	-	-	-	-			

UNIT-I

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

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

UNIT-II

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

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Object Code Generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms.

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

Text Books:

1. John E. Hopcroft, Rajeev M & J D Ullman: "Introduction to Automata Theory Languages &Computation", 3rd Edition, Pearson Education, 2007.

2. Aho, Ullman, Ravisethi: "Compilers Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2009.

Suggested Reading:

1. Andrew W.Appel, "Modern Compiler Construction in C", Cambridge University Press Revised Edition, 2014..
2. Kenneth C Louden, Thomson, "Compiler Construction Principles and Practice", PWS Publishing 1st Edition..
3. A. Meduna, "Elements of Compiler Design", Auerbach Publications, Taylor and Francis Group.
4. V. Raghavan, "Principles of Compiler Design", TMH.
5. K. D. Cooper, L. Torczon, "Engineering a Compiler", ELSEVIER,2014.
6. Kamala Krithivasan and Rama R, "Introduction to Formal Languages and Automata Theory and Computation", Pearson.
7. D. Grune and others, "Modern Compiler Design", Wiley-India.
8. S. F. B. Nasir, P. K. Srimani, "A Text book on Automata Theory", Cambridge Univ. Press.

20AMCXX

ENGINEERING LEADERSHIP

Instruction	1 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	1

20ECO01

REMOTE SENSING AND GIS
(Open Elective – II)

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Basic knowledge of Geography is required

Course Objectives:

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

Course Outcomes:

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	1	-	1	1	1	-	1	-	2			
CO 2	3	1	1	1	-	1	1	1	-	1	-	2			
CO 3	3	1	1	1	-	1	1	1	-	1	-	2			
CO 4	2	1	1	1	-	1	1	1	-	1	-	2			
CO 5	3	1	1	1	-	1	1	1	-	1	-	2			

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text Books:

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

Suggested Reading:

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

20MTO01

FINANCIAL MATHEMATICS
(Open Elective – II)

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

Course Objectives: The objectives of this course are,

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

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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	-	-	-	-	-	-	-	-	1	1			
CO 2	1	2	-	-	-	-	-	-	-	-	1	1			
CO 3	1	2	-	-	-	-	-	-	-	-	1	1			
CO 4	1	2	2	-	-	-	-	-	-	-	1	1			
CO 5	1	2	1	-	-	-	-	2	-	-	1	1			

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text Books:

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

Suggested Reading:

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

20EEO02

ENERGY MANAGEMENT SYSTEMS
(Open Elective – II)

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

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

Course Objectives: The objectives of this course are,

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

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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	-	-	1	-	1	2	1	-	-	-	1			
CO 2	2	1	1	1	-	1	2	1	-	-	-	1			
CO 3	2	2	2	1	-	1	2	1	-	-	-	1			
CO 4	2	2	1	2	2	1	2	1	-	-	-	1			
CO 5	1	1	2	1	1	1	2	2	-	-	-	1			

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

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

UNIT - V

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

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

Text Books:

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

Suggested Reading:

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

20EGO01

TECHNICAL WRITING SKILLS
(Open Elective – II)

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

Course Objectives: The objectives of this course are,

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

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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	-	3	-	-	3	3	3	3			
CO 2	-	-	-	-	-	-	-	-	-	-	-	-			
CO 3	-	-	-	-	-	-	-	-	-	-	3	3			
CO 4	-	-	-	-	-	-	-	3	3	-	-	-			
CO 5	-	-	-	-	-	-	-	-	-	-	-	-			

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text Books:

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

Suggested Reading:

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

Online Resources:

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

20CEO02

DISASTER RISK REDUCTION AND MANAGEMENT
(Open Elective – II)

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

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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	2	2	2	2	1	2	2	2	1			
CO 2	1	1	2	2	2	3	3	1	2	1	1	1			
CO 3	2	2	2	2	2	2	3	2	1	1	2	1			
CO 4	2	2	2	2	3	2	1	1	1	1	1	1			
CO 5	2	1	2	1	2	3	1	2	2	2	2	1			

UNIT - I

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

UNIT - II

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

UNIT - II

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

UNIT - II

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

UNIT - V

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

Text Books:

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

20EGM04

Gender Sensitization

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

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

20EGM02

INDIAN TRADITIONAL KNOWLEDGE

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO 2	-	-	-	-	-	-	-	2	-	-	-	-	1	1	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
CO 5	-	-	-	-	-	2	-	-	-	2	-	-	-	-	1

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 9788185301860Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978- 8185163475
6. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN- 1988207126
7. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
8. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
9. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
10. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
11. Shashi Tharoor, The Hindu Way
12. 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

20AME06

WEB PROGRAMMING LAB

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

Course Objectives:

5. To provide knowledge on developing web pages design and development.
6. To understand how the HTML, CSS and JavaScript components of Bootstrap work.
7. To explore the basic architecture of a React application and develop applications.
8. To gain the basics of frond-end and back-end application development using Nodejs.
5. To understand the basics of MongoDB and its Data Model.

Course Outcomes

Upon successful completion of this course, students will be able to:

6. Develop static web pages using HTML,CSS and Bootstrap
7. Develop interactive web pages using JS.
8. Use React JS frame work in web pages effectively.
9. Create an end-to-end application from scratch using NODE JS and Express.
10. Developing applications using document type data base (MangoDB).

List of Experiments

1. Create static web pages using HTML basic tags
2. Style web pages using CSS, Bootstrap
3. Java script basics – loops, arrays, functions
4. Event handling using Java script
5. User input validation using regular expressions
6. Create dynamic content on web page using HTML DOM – adding , deleting elements, moving elements, changing colors, fonts.
7. React JS – Basic components, forms, events, hook, styling
8. Install and deploy first application in node js
9. Form handling using express and node js
10. Data base connectivity (MongoDB) – CRUD operations using Express and Node js

Text Books:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge — “MongoDB Basics”, Apress, 2014.

Suggested Reading:

1. Ethan Brown, “Web Development with Node and Express”, Oreilly Publishers, First Edition, 2014.

Web Resources:

1. https://web.stanford.edu/class/csl42/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20Edition.pdf

20CAE13

BIG DATA FRAMEWORKS LAB

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

Course Objectives: The objectives of this course are to,

1. 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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	1	2	-	-	-	-	-	-	1			
CO 2	1	1	1	2	2	-	-	-	-	-	-	1			
CO 3	1	-	1	2	2	-	-	-	-	-	-	1			
CO 4	-	-	1	2	2	-	-	-	-	-	-	1			
CO 5	1	-	1	2	2	-	-	-	-	-	-	1			
CO 6	1	-	1	2	2	-	-	-	-	-	-	1			

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. Implementation 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

20AME08

High Performance Computing Lab

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

LIST OF PRACTICALS:

Sr. No	Name of Experiment
1	To study the basic commands of linux.
2	To analyse the Linux based computer systems using following commands: a. top , b.ps , c. kill, d. cat /proc/cpuinfoe.vmstat
3	To setup SSH password less logins for two or more Linux based machines and execute commands on a remote machine
4	Write a program in C to multiply two matrices of size 10000 x 10000 each and find it's execution-time using "time" command. Try to run this program on two or more machines having different configurations and compare execution-times obtained in each run. Comment on which factors affect the performance of the program
5	Write a "Hello World" program using OpenMP library also display number of threads created during execution
6	Write a parallel program to calculate the value of PI/Area of Circle using OpenMP library.
7	Write a parallel program to multiply two matrices using openMP library and compare the execution time with its serial version. Also change the number of threads using omp_set_num_threads() function and analyse how thread count affects the execution time
8	To establish Beowulf Cluster using MPI(Message Passing Interface) Library.
9	Install MPICH library and write a "Hello World" program for the same.
10	Write a parallel program to multiply two matrices using MPI library and compare the execution-time with it‘s OpenMP and serial version
11	To study a Grid Simulation Toolkit.
12	To run two sample programs using GridSim Toolkit.
13	To study a Cloud Simulation Toolkit.
14	To setup Cloud.

H/W Requirements :RAM 512 MB, Printer, Cartridges
S/W Requirements :Linux Operating System

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	2	3	1	1	2	2	2	2	1			
CO 2	2	2	2	2	2	1	1	2	3	2	2	1			
CO 3	1	1	3	2	3	2	-	2	2	2	1	1			
CO 4	2	2	2	3	3	1	-	2	3	2	1	-			
CO 5	1	2	2	2	3	2	1	2	2	2	2	1			
CO 6	1	2	3	3	3	1	2	2	2	2	1	-			

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

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

AICTE Model Curriculum with effect from AY 2023-24

B.E. (Artificial Intelligence &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	**20XXXX**	Professional Elective-V	3	-	-	3	40	60	3
2	**20XXXX**	Open Elective – III	3	-	-	3	40	60	3
3	**20EGM01**	Indian Constitution	2	-	-	2	-	50	Non-Credit
PRACTICAL									
4	**20AMC17**	Technical Seminar	-	-	3	-	50	-	1.5
5	**20AMC18**	Capstone Project-II (Part 2)	-	-	8	Viva-Voce	100	100	4
TOTAL			**8**	**-**	**11**	**8**	**230**	**270**	**11.5**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

CODE	Professional Elective - V(T)	CODE	Open Elective – III
20AME09	UAV	**20PYO05**	History of Science and Technology
20CSE35	Augmented Reality and Virtual Reality	**20MEO03**	Research Methodologies
20CSE24	Block chain Technology	**20MEO04**	Entrepreneurship
20CAC06	Network and System Administration	**20ECO05**	System Automation and Control
		20EEO03	Energy Auditing

20AME09

Unmanned Ariel Vehicles
(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 objective of this course is to understand
1. The features of UAV and elements.
2. Navigation and guidance of UAV
3. Design and Simulate UAV.

Course Outcomes:-
On completion of the course students will be able to
1. Explain the types and characteristics of UAVs and their applications.
2. Illustrate the concepts of aerodynamics of flight vehicle.
3. Demonstrate UAV elements
4. Identify and explain the components, sensors and payload of UAVs, their navigation and guidance
5. Design and perform structural, aerodynamic analysis of UAV components.

Mapping of Course Outcomes with Program Outcomes and Program Specific outcomes

PO /PSO CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO 1	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-
CO 2	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-
CO 3	1	-	-	-	-	-	-	-	1	-	-	1	2	2	1
CO 4	1	2	1	1	2	-	-	-	1	-	-	1	2	1	1
CO 5	1	2	1	1	2	-	-	-	1	-	-	1	1	1	1

Unit-I:
Introduction to UAV
UAV: Definition, History; Difference between aircraft and UAV; DGCA Classification of UAVs; Types and Characteristics of Drones: Fixed, Multi-rotor, and Flapping Wing; Applications: Defense, Civil, Environmental monitoring.

Unit-II:
Basics of Flight and Aerodynamics
Different types of flight vehicles; Components and functions of an airplane ; Forces actin9 on Airplane; Physical properties and structure of the atmosphere; Aerodynamics - aerofoil nomenclature, aerofoil characteristics, Angle of attack, Each number, Lift and Drag, Propulsion and airplane structures.

Unit-III:
UAV Elements
Components: Arms, motors, propellers, electronic speed controller (ESC), flight controller; Propulsion, Data Link; Sensors and Payloads: GPS, ITU, Light Detection and Ranging (LiDAR), Imaging cameras, Classification of payload based on applications;

Unit-IV
UAV Navigation
Hyper-spectral sensors; Laser Detection and Range (LADAR); Synthetic ADerture Radar (SAR); Thermal cameras; ultra-sonic detectors; Case study on payloads. Introduction to navigation systems and types of guidance; Mission Planning and Control.

Unit-V:
Design & Simulation of UAV
Introduction to CAD; Design of UAV components; Structural Analysis using CAE; Aerodynamic Analysis using CFE; Manufacturing of the components of UAVs: 3D printing; Case studies;

SUGGESTED TEXT BOOKS

1. Andey Lennon, 'Basics of R/C Model Aircraft Design" Model Airplane News Publication
2. John Baichtal, Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.

REFRENCE TEXT BOOKS

1. K Valavanis, George Vachtsevanos, Handbook of Unmanned Aerial Vehicles, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
2. DGCA RPAS Guidance Manual, Revision 3 – 2020.

ONLINE RESOURCES

1. Design of fixed unmanned aerial vehicle – course by NPTEL
   Link :- https://onlinecourses.nptel.ac.in/noc21_ae13/preview
2. UAV Design for agriculture – online course by edx
   Link:- https://www.edx.org/course/drones-for-agriculture-prepare-and-design-your-dro

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, Computer Vision.

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.
2. Jos Dirksen, "Learning Three.js: The JavaScript 3D Library for WebGL", 2nd Revised Edition, Packt Publishing, 2015.
3. Jos Dirksen, "Learning Three.js : programming 3D animations and visualizations for the web with HTML5 and WebGL, 3rd Edition, 2018

20CSE24

BLOCKCHAIN TECHNOLOGY
(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, 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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	1	-	-	-	-	-	-	-	2			
CO 2	2	2	2	1	-	-	-	-	-	-	-	-			
CO 3	3	3	2	2	1	-	-	-	-	-	-	-			
CO 4	3	2	2	2	1	-	-	-	-	-	-	-			
CO 5	3	2	2	2	1	-	-	-	-	-	-	-			
CO 6	3	2	1	1	-	2	1	-	-	-	-	1			

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/

20CAC06 **NETWORK AND SYSTEM ADMINISTRATION**
(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

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	2	1	-	-	-	-	-	-	2			
CO 2	2	2	2	2	2	-	-	-	-	-	-	2			
CO 3	3	3	2	2	3	-	-	-	-	-	-	2			
CO 4	3	2	2	2	2	-	-	-	-	-	-	2			
CO 5	3	2	2	2	2	-	-	-	-	-	-	2			
CO 6	2	2	3	2	3	-	-	-	-	-	-	2			

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

20PYO05

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	1	1	2	2	1	1	2	1	2			
CO 2	3	1	2	1	2	2	2	1	2	2	2	2			
CO 3	2	2	1	1	1	1	1	1	1	2	1	2			
CO 4	3	2	2	2	2	2	2	1	1	2	1	2			
CO 5	3	2	2	2	2	2	2	2	1	2	1	2			

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

TextBooks:

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1															
CO 2															
CO 3															
CO 4															
CO 5															

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	-	3	1	1	3	3	2	1	1	2	2	1	-	-
CO 2	2	-	2	2	1	3	3	2	3	3	3	2	1	-	-
CO 3	-	-	1	3	2	3	3	2	3	3	3	2	-	1	2
CO 4	1	-	1	3	2	3	3	2	1	3	3	1	-	-	1
CO 5	2	-	2	2	1	-	2	2	1	2	2	1	1	-	1

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	3	2	2	1	-	-	1	-	-	2			
CO 2	3	3	3	2	1	1	-	-	1	-	-	1			
CO 3	3	3	3	3	2	1	-	-	1	-	-	2			
CO 4	2	2	2	2	2	2	-	-	1	-	-	2			
CO 5	3	3	3	3	2	2	-	-	2	-	-	1			

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	1	1	1	2	-	-	-	-	1	1			
CO 2	2	1	3	2	1	2	-	-	-	-	1	1			
CO 3	2	1	3	2	1	2	-	-	-	-	2	2			
CO 4	2	1	2	2	1	2	-	-	-	-	2	2			
CO 5	1	1	2	1	1	2	-	-	-	-	2	2			

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

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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

20AMC17

TECHNICAL SEMINAR

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

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

20AMC18

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. 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

S. No.	Open Electives Offered By AIML Dept.
1	Ethical Intelligence
2	Introduction to Artificial Intelligence Machine Learning

ETHICAL INTELLIGENCE

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: Not required

Course Objectives:
This course aims to:

1. To learn conceptual framework for analyzing ethical issues that AI systems and algorithms, pose to our society.
2. ***To provide a good understanding of the foundations of modern and ancient approaches to ethics and their differences.***
3. ***Applying knowledge and understanding of AI in information transmission and processing.***

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

1. ***Enhance and apply their understanding of ethics broadly.***
2. ***Gain familiarity with the problems of ethics.***
3. ***Come up with possible solutions, specifically related to algorithms and AI.***
4. Apply their ethical understanding in analyzing cases involving AI.
5. Can apply ethical understanding to any field like social media, data etc.

Unit I

Introduction: Definition of morality and ethics in AI, Impact on society, Impact on human psychology, Impact on the legal system, Impact on the environment and the planet, Impact on trust.
Software Qualities and Normative Ethics: Interpretability, transparency, and normative ethics, Interpretability, transparency, and policy making, Extensibility, usability, and communicability.

Unit-II
AI and Ethics- Challenges and Opportunites: Challenges, Opportunities- AI Technologies, ethical issues in artificial intelligence, Societal Issues Concerning the Application of Artificial Intelligence in Medicine, Decision-making role in industries, National and International Strategies on AI.

Unit III
AI Standards and Regulation: Model Process for Addressing Ethical Concerns during System Design, Transparency of Autonomous Systems.
Data Privacy Process: Algorithmic Bias Considerations, Ontological Standard for Ethically Driven Robotics and Automation Systems.
Unit IV
Ethics of information and Ethics of AI: Ethical issues for different strengths/grades of AI and AI algorithms, Ethics of AI on the Web and in Web based applications, AI technology and social hierarchy.
Normative ethics proposals: Advantages and disadvantages, Care ethics, Virtue Ethics, Problems with implementation, Problems with uptake and enforcement.

Unit V
AI, Information transmission, Information processing, and Privacy.
Big data and privacy: Big data and human identity, Gender and cultural bias.
Black boxes: Big data, Recurrent Neural Nets, Black boxes, and social construction

Text Books:
1. John C. Havens "Heartificial Intelligence: Embracing Our Humanity to Maximize Machines Paperback "– Illustrated, 2 February 2016 .
2. Patrick Lin, Keith Abney, George A Bekey, "Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

3. Ethics, Moral Philosophy, and AI Bauer, W. A. (2020). “Virtuous vs. utilitarian artificial moral agents. AI and Society”. Bryson, J. J. (2018)..

Suggested Reading:

1. Michael J. Quinn “Ethics for the Information Age”
2. Mark coeckelbergh ” AI Ethics”

Online Resources:

1. **Ethical Intelligence: Change the Way You Live Your Life | Udemy**