SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204
Estd:1980

Regulation: R20	IV / IV - B.Tech. I - Semester

CSE (IoT AND CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2022-23 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20HS4101	Universal Human Values-2: Understanding Harmony	HS	3	3	0	0	30	70	100
#PE-III	Professional Elective -III	PE	3	3	0	0	30	70	100
#PE-IV	Professional Elective -IV	PE	3	3	0	0	30	70	100
#PE-V	Professional Elective -V	PE	3	3	0	0	30	70	100
#OE-III	Open Elective-III	OE	3	3	0	0	30	70	100
#OE-IV	Open Elective-IV	OE	3	3	0	0	30	70	100
B20CI4114	Ethical Hacking	SOC	2	1	0	2	--	50	50
B20CI4115	Industrial/Research Internship 2 Months	PR	3	--	--	--	--	50	50
		TOTAL	**23**	**19**	**0**	**2**	**180**	**520**	**700**

	Course Code	Course
#PE-III	B20CI4101	Software Testing Methodologies
	B20CI4102	Data Science
	B20CI4103	Privacy and Security in IOT
	B20CS4101	Cloud Computing
	B20CI4104	Mean Stack Technologies
#PE-IV	B20CI4105	Malware Analysis & Reverse Engineering
	B20CI4106	Information Security management Standards (ISMS).
	B20CI4107	Cyber Crime Investigation and Digital Forensics
	B20CI4108	Intrusion Detection Systems
	B20CI4109	Deep Learning
#PE-V	B20CI4110	Quantum Computing
	B20CI4111	DevOps
	B20CI4112	Machine Learning
	B20CI4113	Mobile and Wireless Security
#OE-III & #OE-IV	Student has to study one Open Elective each from OE-III & IV offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS4101	**HS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY

(Common to AIDS, CIC, CSBS, CSE, CSG, IT & ME)

Course Objectives:

1.	To enable students appreciate the essential complementarity between 'Values' and 'Skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To understand the harmony in the human being, family, society and nature/existence
3.	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.

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

S.No	Outcome	Knowledge Level
1.	Identify the importance of human values and skills for sustained happiness	K2
2.	Understand the balance between profession and personal happiness/ goals.	K2
3.	Express their commitment towards what they have understood (human values, human relationship and human society)	K2
4.	Explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.	K2
5.	Develop/ propose appropriate technologies and management patterns to create harmony in professional and personal life.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Course Introduction** - Need, Basic Guidelines, Content and Process for Value Education, Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
UNIT-II (08 Hrs)	**Understanding Harmony in the Human Being** - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of

	Prosperity in detail; Programs to ensure Sanyam and Health.
UNIT-III (08 Hrs)	**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
UNIT-IV (08 Hrs)	**Understanding Harmony in the Nature and Existence** - Existence as Coexistence, Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature, recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence.
UNIT-V (08 Hrs)	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order, b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.
Textbooks:	
1.	Human Values and Professional Ethics by RR. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010.
Reference Books:	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth
5.	Small is Beautiful E. F Schumacher by Mohandas Karamchand Gandhi
6.	Slow is Beautiful Cecile Andrews
7.	Economy of Permanence J C Kumarappa
8.	Bharat Mein Angreji Raj Pandit Sunderlal
9.	Rediscovering India by Dharampal Hind Swaraj or Indian Home

10.	Rule by Mohandas K. Gandhi
11.	India Wins Freedom Vivekananda Maulana Abdul Kalam Azad 12Romain Rolland (English)

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B20CI4101	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

SOFTWARE TESTING METHODOLOGIES

(For CIC)

Course Objectives:

1.	To introduce fundamental concepts, goals, and methodologies of software testing, including verification and validation techniques.
2.	To explore dynamic and static testing techniques such as black-box and white-box testing, along with regression and validation activities.
3.	To understand test suite management, software quality assurance (SQA) models, debugging techniques, and the role of automation in software testing.
4.	To familiarize students with modern testing tools, including Selenium, JUnit, and LoadRunner, and their application in testing web and mobile-based software systems.

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

S.No	Outcome	Knowledge Level
1.	Summarize the evolution, goals, psychology, and methodologies of software testing and apply the testing strategies	**K3**
2.	Apply black-box and white-box testing techniques to assess software functionality and reliability.	**K3**
3.	Apply static testing techniques, validation methods, and regression testing strategies to improve software quality.	**K3**
4.	Analyze test suite management strategies and software quality metrics to enhance testing effectiveness.	**K4**
5.	Implement automation testing techniques using appropriate tools	**K3**

SYLLABUS

UNIT-I (10Hrs)	Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology. Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.
UNIT-II (10 Hrs)	Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing. White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT-III (10 Hrs)	Static Testing: Inspections, Structured Walkthroughs, Technical Reviews. Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs. regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques
UNIT-IV (10 Hrs)	Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite Software Quality Management: Software Quality metrics, SQA models. Debugging: process, techniques, correcting bugs
UNIT-V (10 Hrs)	Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool. Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering.
Textbooks:	
1.	Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2.	Software Testing, Yogesh Singh, CAMBRIDGE
Reference Books:	
1.	Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2.	Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
3.	Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4.	Effective methods of Software Testing, Perry, John Wiley, 3ed, Wiley
e-Resources	
1.	NOC: Software Testing, ST: (Video) https://nptel.ac.in/courses/106/101/106101163/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4102	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA SCIENCE

(For CIC)

Course Objectives:

1.	Acquire fundamental knowledge and expertise to become a proficient data scientist.
2.	Understand the principles of statistics and machine learning essential for data science.
3.	Learn methods for performing statistical analysis on datasets.
4.	Explore the significance of exploratory data analysis (EDA) in extracting insights from data.
5.	Evaluate data visualizations based on their design, effectiveness, and ability to communicate insights from data.

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

S.No.	Outcome	Knowledge Level
1.	Describe the fundamentals of Data Science and the essential skill sets required to become a data scientist.	K2
2.	Illustrate the concept of Statistical Inference and identify probability distributions commonly used for statistical modeling. Fit an appropriate model to given data.	K2
3.	Apply basic tools such as plots, graphs, and summary statistics to conduct Exploratory Data Analysis (EDA).	K3
4.	Explain the Data Science Process and analyze the interaction between its components	K2
5.	Utilize APIs and other tools to scrape the web and collect relevant data for analysis.	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction, The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.
UNIT-II (10 Hrs)	**Visualizing Data:** matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation. **Gradient Descent:** The Idea Behind Gradient Descent, Estimating the Gradient, Using the

	Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.
UNIT-III (10 Hrs)	Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs, Working with Data: Exploring Your Data Using Named Tuples, Data classes, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem
UNIT-IV (10 Hrs)	Machine Learning: Modeling, Over fitting and Under fitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression
UNIT-V (10 Hrs)	Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item Based Collaborative Filtering, Matrix Factorization Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization.
Textbooks:	
1.	Joel Grus, "Data Science From Scratch", OReilly.
2.	Allen B. Downey, "Think Stats", OReilly.
Reference Books:	
1.	Doing Data Science: Straight Talk FromThe Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2.	Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
3.	"The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
4.	"Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4103	**PE**	**3**	**–**	**–**	**3**	**30**	**70**	**3 Hrs.**

PRIVACY AND SECURITY IN IOT

(For CIC)

Course Objectives:

1.	Ability to understand the Security requirements in IoT.
2.	Ability to cryptographic fundamentals, authentication credentials and access control.
3.	Understand the various types Trust models and Cloud Security.

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

S.No	Outcome	Knowledge Level
1.	Describe different Security and privacy concepts in IoT devices	K2
2.	Explain various Cryptographic functions for IoT	K2
3.	Demonstrate different Frameworks and Hardware Architecture of IoT Device.	K2
4.	Illustrate various robust schemes and trusted models	K2
5.	Describe Cloud services and security controls	K2

SYLLABUS

UNIT-I (10Hrs)	**INTRODUCTION: SECURING THE INTERNET OF THINGS** Security Requirements in IoT Architecture Security in Enabling Technologies Security Concerns in IoT Applications. Security Architecture in the Internet of Things, Security Requirements in IoT, Insufficient Authentication/Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability, Attacks Specific to IoT. Vulnerabilities, Secrecy and Secret, Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Attack & Fault trees.
UNIT-II (10 Hrs)	**CRYPTOGRAPHIC FUNDAMENTALS FOR IOT** Cryptographic primitives and its role in IoT, Encryption and Decryption – Hashes – Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IoT messaging and communication protocols, IoT Node Authentication.
UNIT-III (10 Hrs)	**IDENTITY & ACCESS MANAGEMENT SOLUTIONS FOR IOT** Identity lifecycle, authentication credentials, IoT IAM infrastructure, Authorization with Publish / Subscribe schemes, access control.
UNIT-IV (10 Hrs)	**PRIVACY PRESERVATION AND TRUST MODELS FOR IOT** Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IoT, self-organizing Things, Preventing unauthorized access.

UNIT-V (10 Hrs)	**CLOUD SECURITY FOR IOT** Cloud services and IoT, offerings related to IoT from cloud service providers, Cloud IoT security controls, An enterprise IoT cloud security architecture, New directions in cloud enabled IoT computing.
Textbooks:	
1.	Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren.
2.	Securing the Internet of Things Elsevier.
3.	Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4101	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

CLOUD COMPUTING

(For CIC)

Course Objectives:

1	Fundamentals of Cloud Computing, Concepts of Virtualization and the Cloud delivery and Deployment Models.
2	To introduce the various levels of services that can be achieved by cloud.
3	To motivate students to do programming and experiment with the various cloud computing environments.
4	Common types of persistent storage devices, Cloud computing software security objectives design principles and development practices.
5	To motivate students to do programming and experiment with the various cloud computing environments.

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

S. No	OUT COME	Knowledge Level
1	**Apply** concepts of network-centric computing, cloud models, and distributed systems to analyze cloud challenges and model concurrency.	K3
2	**Demonstrate** understanding of cloud infrastructure and paradigms to evaluate platforms, applications, and deployment challenges.	K3
3	**Use** virtualization and cloud resource management techniques for efficient allocation and scheduling.	K3
4	**Analyze** cloud storage systems and security risks to understand data management and protection strategies.	K4
5	**Model** cloud-based applications using platforms like AWS, Google App Engine, and Microsoft Azure.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction:** Network centric computing, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, communication protocols, message delivery rules, concurrency, and model concurrency with Petri Nets.
UNIT-II (10 Hrs)	**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT-III (10 Hrs)	**Cloud Resource virtualization**: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, hardware support for virtualization, Case Study: Xen. Cloud Resource Management and Scheduling: Policies and Mechanisms, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines.
UNIT-IV (10 Hrs)	**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), **Cloud Security:** Cloud security risks, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.
UNIT-V (10 Hrs)	**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Microsoft Dynamics CRM (Text Book 2).

TEXTBOOK:	
1.	Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2.	Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017
REFERENCE BOOKS:	
1.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH 2013
2.	Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3.	Cloud Computing, A Hands on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4104	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MEAN STACK TECHNOLOGIES

(For CIC)

Course Objectives: Students are expected to learn

1	Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
2	Writing optimized front end code HTML and JavaScript
3	Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
4	Design and implementation of Robust and Scalable Front End Applications

Course Out Comes: At the end of the course students will be able to

S. No	OUT COME	Knowledge Level
1	Enumerate the Basic Concepts of Web &Markup Languages	K2
2	Develop web Applications using Scripting Languages & Frameworks	K4
3	Make use of Express JS and Node JS frameworks	K3
4	Illustrate the uses of web services concepts like restful, react js	K2
5	Apply Deployment Techniques & Working with cloud platform	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Web**: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. **HTML5 concepts**, CSS3, Anatomy of a web page. **XML**: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.
UNIT-II (10 Hrs)	**JavaScript**: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.
UNIT-III (10 Hrs)	**Node.js**: Introduction, Advantages, Node.js Process Model, Node JS Modules. **Express.js**: Introduction to Express Framework, Introduction to Nodejs ,What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT-IV (10 Hrs)	**RESTful Web Services**: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. **React Js**: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.
UNIT-V (10 Hrs)	**Mongo DB**: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

TEXTBOOKS:	
1.	Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson
2.	Web Technologies, Uttam K Roy, Oxford
REFERENCE BOOKS:	
1.	Pro Mean Stack Development, ELadElrom, Apress
2.	Restful Web Services Cookbook, SubbuAllamraju, O'Reilly
3.	JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
4.	Web Hosting for Dummies, Peter Pollock, John Wiley Brand
5.	Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
6.	Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
7.	Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
8.	An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
9.	Express.JS Guide,The Comprehensive Book on Express.js, AzatMardan, Lean Publishing.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4105	**PE**	**3**	**0**	**0**	**3**	**30**	**70**	**3Hrs.**

MALWARE ANALYSIS & REVERSE ENGINEERING

(For CIC)

Pre-requisites: OS, Networking, Security Principles

Course Objectives:

1.	To learn fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code
2.	To explore the techniques for detecting, analyzing, reverse engineering and eradicating malware.
3.	Employ network and system-monitoring tools to examine how malware interacts with the file system, registry, network, and other processes in a Windows environment.
4.	Assess the threat associated with malicious documents.

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

S. No	Outcome	Knowledge Level
1.	**Demonstrate** the concept of malware and reverse engineering.	K2
2.	**Apply** various tools and techniques of malware analysis to examine malicious software.	K3
3.	**Use** various debugging techniques for malware analysis to identify vulnerabilities.	K3
4.	**Demonstrate** the process of memory forensics to identify injected code.	K2
5.	**Use** WHOIS,DNS for creating reverse IP,static and interactive maps.	K3

SYLLABUS

UNIT-I (10Hrs)	Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioural Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV Signatures, Creating Custom Clam AV Databases
UNIT-II (10 Hrs)	Malware Forensics Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plu-gins, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.
UNIT-III	Malware and Kernel Debugging Opening and Attaching to Processes, Configuration

(10Hrs)	of JIT Debugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X).
UNIT-IV (10 Hrs)	Memory Forensics and Volatility Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.
UNIT-V (8Hrs)	Researching and Mapping Source Domains/IPs Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.
Text Books:	
1.	Sikorski, M., & Honig, "A. Practical malware analysis: the hands-on guide to dissecting malicious software". No starch press,2012
2.	Eilam, E. "Reversing, Secrets of Reverse Engineering", Wiley Publishing,2005.
Reference Books:	
1.	Shashidhar, N., & Cooper, P. (2016, April). Teaching malware analysis: The design philosophy of a model curriculum. In 2016 4th International Symposium on Digital Forensic and Security (ISDFS) (pp. 119-125). IEEE.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4106	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

INFORMATION SECURITY MANAGEMENT STANDARDS

(For CIC)

Course Objectives:

1.	To understand the importance of information security.
2.	To learn different strategies to implement and integrate security within an organization.
3.	To Understand the important role of the risk management to achieve the security within an Organization.

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

S.No	Outcome	Knowledge Level
1.	Demonstrate key concepts of information security and planning for information security in the enterprise.	**K2**
2.	Explain different types of security policies in place and security program development for the information security needs.	**K2**
3.	Critically analyze, evaluate and articulate the diverse aspects of the information security risk to the organization	**K3**
4.	Explain Security Management practices and Contingencies planning for information security in an organization	**K2**
5.	Analyze and expound on payment card industry compliance such as PCIDSS.	**K4**

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** What is security? CNSS Security Model, Key concepts of information security, what is management, Principles of information security management. **Planning for Security:** Introduction, the role of planning, Precursors to planning, Strategic planning, Information security governance, planning for information security implementation.
UNIT-II (10 Hrs)	**Information Security Policy:** Why policy? Enterprise Information Security Policy, Issue Specific Security Policy, System Specific security policy. **Developing the Security Program**: Introduction, organizing for security, placing information security within an organization. Components of the Security program, implementing security education, training and awareness programs, project management in information security.
UNIT-III (10 Hrs)	**Risk Management:** Introduction, Risk Identification, Risk Analysis, Risk Evaluation, Risk control, Risk communication monitoringand review. Risk Management Methodologies. **Security Management Models:** Introduction, Blueprints, Frameworks, and Security

	Models,ISO 27000 series, NIST Security management models,Security Architecture Models,Access control models
UNIT-IV (10 Hrs)	**Security Management practices**: Security Employment Practices, Information Security Performance Measurement, Benchmarking. **Planning for Contingencies:** Introduction, Incident Response, Disaster Recovery,Business Continuity.
UNIT-V (10 Hrs)	**PCIDSS:** Introduction and PCI Data Security Standard Overview, PCI DSS Applicability Information, Relationship between PCIDSS and PCISSC Software Standards, Scope of PCI DSS Requirements, Best Practices for Implementing PCIDSS into Business-as-Usual Processes, PCIDSS Sampling Considerations, Description of Timeframes Used in PCIDSS Requirements, Approaches for Implementing and Validating PCIDSS, Protecting Information About an Entity's Security Posture, Testing Methods for PCIDSS Requirements, PCIDSS Assessment Process, Detailed PCIDSS Requirements and Testing Procedures, Understanding the Parts of the Requirements.
Textbooks:	
1.	Management of Information Security, Sixth Edition, Michael E. Whitman and Herbert J. Mattord, Cengage Learning.
2.	PCI-DSS-v4-0.pdf

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4107	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS

(For CIC)

Course Objectives:

1.	Able to identify security risks and take preventive steps.
2.	To understand the forensics fundamentals.
3.	To understand the evidence capturing and preservation process.

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

S.No	Outcome	Knowledge Level
1.	Classify various types and categories of cybercrimes.	K2
2.	Describe various forms of unauthorized access, computer intrusions, and white-collar cyber crimes, along with their implications.	K2
3.	Demonstrate knowledge of cyber crime investigation processes.	K2
4.	Utilize digital forensic tools and techniques for system-level analysis.	K3
5.	Demonstrate CERT-In security guidelines for securing web servers, databases, intrusion detection systems, routers, and networked environments.	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.
UNIT-II (10 Hrs)	**Cyber Crime Issues:** Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.
UNIT-III (10 Hrs)	**Investigation:** Introduction to Cyber Crime Investigation, Investigation Tools, e-Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, EMail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT-IV (10 Hrs)	**Digital Forensics:** Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT-V (10 Hrs)	**Role of CRET-In Cyber Security:** Computer Security Incident Response (Reactive) – Computer Security Incident Prevention (Proactive) – Security Quality Management Services, CERT-In Security Guidelines- Web server, database server, IntrusionDetection system, Routers, Standard alone system, networked System, IT Security polices for government and critical sector organizations.
Textbooks:	
1.	Nihad A. Hassan, ―Digital Forensics Basics: A Practical Guide Using Windows OS Paperback‖, February 26, 2019.
Reference Books:	
1.	NelsonPhillips and Enfinger Steuart, -Computer Forensics and Investigationsl, Cengage Learning, New Delhi, 2009.
2.	Kevin Mandia, Chris Prosise, Matt Pepe, -Incident Response and Computer Forensics-, Tata Mc Graw-Hill, New Delhi, 2006.
3.	Robert M Slade,‖ Software Forensics‖, Tata McGraw - Hill, New Delhi, 2005

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4108	**PE**	**3**	**0**	**0**	**3**	**30**	**70**	**3Hrs.**

INTRUSION DETECTION SYSTEMS

(For CIC)

Pre-requisites: CNS, Cyber security

Course Objectives:

1.	To understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.
2.	To Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
3.	To Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
4.	To learn agent development for intrusion detection and architectural models of IDs and IPs.

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

S.No	Outcome	Knowledge Level
1.	**Explain** basic concepts of intrusion detection systems.	K2
2.	**Apply** Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis	K3
3.	**Use** snort to install and learn different alert modes.	K3
4.	**Apply** snort rules to configure files and mysql.	K3
5.	**Illustrate** agent development for intrusion detection and architectural models of IDs and IPs.	K2

SYLLABUS

UNIT-I (10Hrs)	History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.
UNIT-II (10 Hrs)	Intrusion Prevention Systems, Network IDs protocol basedIDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis
UNIT-III (10Hrs)	Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.
UNIT-IV (10 Hrs)	Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL

UNIT-V (8Hrs)	Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.
Text Books:	
1.	Rafeeq Rehman: "Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall, 2003.
2.	Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition,Springer, 2005.
Reference Books:	
1.	Carl Endorf, Eugene Schultz and Jim Mellander, "Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
2.	T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.
e-Resources	
	https://nptel.ac.in/courses/106106178

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B20CI4109	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DEEP LEARNING

(For CIC)

Course Objectives:

1.	Understand concepts of deep feed forward network mechanisms
2.	Understand and analyze the concepts of CNN, RNN models
3.	Study the concepts of auto encoders, optimization techniques and DNN models

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

S.No	Outcome	Knowledge Level
1.	Demonstrate the basic concept of Machine learning	**K2**
2.	Apply the concepts of deep feed forward networks	**K3**
3.	Apply the concepts of CNN & RNN models	**K3**
4.	Apply optimization techniques and auto encoders.	**K3**
5.	Apply different DNN models in the applications.	**K3**

SYLLABUS

UNIT-I (10Hrs)	**Historical Trends in Deep Learning-Machine Learning Basics**: Learning Algorithms, Linear Algebra for machine Learning, Probability Distributions, Marginal Probability, Conditional Probability, Variance and Covariance, Bayes' Rule, Testing, Cross Validation, Dimensionality Reduction, Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.
UNIT-II (10 Hrs)	**Machine Learning:** Over/Under-fitting, Hyper parameters and validation sets, Bias, Variance, Supervised and Unsupervised Training, Maximum Likelihood, Bayesian Statistics. **Deep Feed Forward Networks:** Introduction, Various Activation Functions, error functions, Regularization for Deep learning, Early Stopping, Drop out.
UNIT-III (10 Hrs)	**Convolutional Neural Networks:** Convolutional operation, Pooling, Normalization, Basic Convolution Functions. **Sequence Modeling:** Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Long Short-Term Memory, Gated RNNs.
UNIT-IV (10 Hrs)	**Auto Encoders and Optimization Algorithms:** Auto encoders, under complete, denoising, **Optimization for Deep Learning:** Gradient descent, stochastic gradient

	descent, mini batch gradient descent, Adagrad, RMSProp, Adam.
UNIT-V (10 Hrs)	More **Deep Learning Architectures & Applications**: Alexnet, ResNet, Transfer learning, **Deep Generative Models:** Boltzmann Machines, Restricted Boltzmann Machines Sentiment Analysis using LSTM, Image Segmentation.

Textbooks:	
1.	Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016 (available at http://www.deeplearningbook.org)
2.	Charu C Agarwal, "Neural Networks and Deep Learning", IBM T. J. Watson Research Center, International Business Machines, Springer, 2018
Reference Books:	
1.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2.	Michael Nielsen, "Neural Networks and Deep Learning", Online book, 2016 (http://neuralnetworksanddeeplearning.com/)
3.	Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Foundations and Trends in Signal Processing, 2013.
4.	Christopher and M. Bishop, "Pattern Recognition and Machine Learning", Springer Science Business Media, 2006.
5.	Jason Brownlee , "Deep Learning with Python" ,ebook, 2016
6.	N. D. Lewis, "Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science, 2016.
7.	Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018
e-Resources	
1.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-and-tensorflow-backend-6eaab98d14dd
2.	https://www.analyticsvidhya.com/blog/2017/08/10-advanced-deep-learning-architectures-data-scientists/
3.	https://www.geeksforgeeks.org/cross-validation-machine-learning/
4.	https://www.geeksforgeeks.org/activation-functions-neural-networks/
5.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f09948
6.	https://medium.com/@lamiae.hana/a-step-by-step-guide-on-sentiment-analysis-with-rnn-and-lstm-3a293817e314
7.	https://towardsdatascience.com/common-loss-functions-in-machine-learning-46af0ffc4d23
8.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B20CI4110	PE	3	--	--	3	30	70	3 Hrs.

QUANTUM COMPUTING

(For CIC)

Course Objectives:

1.	To introduce the mathematical tools and theoretical foundations required for understanding quantum computation
2.	To develop the ability to model and implement quantum systems using qubits, quantum gates, circuits, and algorithms.
3.	To provide knowledge of quantum error correction methods and familiarize students with quantum programming tools and libraries

Course Outcomes

S. No	Outcome	Knowledge Level
1.	Explain the foundational principles of quantum computing including quantum mechanics, vector spaces, and quantum operators	K2
2.	Describe qubit representation, measurement, and entanglement	K2
3.	Construct basic quantum circuits using quantum gates	K3
4.	Illustrate different quantum hardware technologies and their features	K2
5.	Analyze quantum errors, apply basic error correction codes, and explore programming libraries for quantum simulation	K4

SYLLABUS

UNIT-I (12Hrs)	**Foundations of Quantum computer** **Introduction:** Moore's law-A Brief History of Quantum Computing **Mathematical Tools for Quantum Computing:** Complex Numbers, Vector Space, and **Dirac Notation:** Complex Numbers, Conjugation, Vector Space, Basis Set, Dirac Notation, Inner Product, linearly Dependent and Independent Vectors, Dual Vector Space, Computational Basis, Outer Product **Basics of Quantum Mechanics:** limitations of Classical Physics: Blackbody Radiation, Plank's Constant, Photoelectric Effect, Classical Electromagnetic Theory, Rutherford's Model of the Atom, Bohr's Model of Atoms, Particle and Wave Nature of Light, Wave Function, Postulates of Quantum Mechanics. **Matrices and Operators:** Matrices, Square Matrices, Diagonal (or Triangular), Matrix, Operators· Linear Operator, Commutator, Matrix Representation of a Linear Operator, Symmetric Matrix, Transpose Operation, Orthogonal Matrices, Identity Operator, Adjoint Operator, Joint Operator, Hermitian Operator, Unitary Operators, Projection Operator
UNIT-II (10 Hrs)	**Qubits, Operators and Measurement** **Qubits** - Representation of Qubits, Quantum Operators - Representing Superposition of States. Unary Operators - Binary Operators - The Qubit as a Hilbert Space. - The Measurement Postulate. Density operators, generalized measurements, no-cloning theorem. **Superposition** Polarization of light, Single qubit notation, Measurement of Qubit

	Entanglement: Entangled States, Testing for Entangled States, Bell Pair and Bell States, EPR Paradox & Bell Theorem/Conditional Instructions, Quantum Teleportation, No-Cloning Theorem, Superdense Coding
UNIT-III (10 Hrs)	**Quantum gates and Quantum circuits** General quantum operations, quantum circuit model, quantum gates, Comparison with Classical Gates, universal sets of quantum gates, quantum circuits Model of computation (movement on Bloch Sphere), X, Y, Z, H gates, CNOT, Toffoli, Fredkin, SWAP gate, Controlled-U Gate, Reversible Gates, Simple circuits, Quantum Adder, Reversible circuits. Analyzing Pauli gates, Analyzing Cascade of gates, Analyzing Two-qubit gates, Tensor Product (example)
UNIT-IV (10 Hrs)	**Quantum Hardware, Quantum Algorithms:** Assessing a Quantum Computer, Neutral Atom, NMR, Photonics, Semiconductor quantum transistor, Spin Qubits, Superconducting Qubits, Trapped Ion Quantum Algorithms: Deutsch, Deutsch-Jozsa, Grover Algorithm, Shor's Algorithm, QFT (Basics)
UNIT-V (8 Hrs)	**Error Correction and Programming Libraries:** Error Correction: Unique challenges in QEC, Shor's bit-flip code, Shor's phase-flip code, Shor 9-qubit code, Steane code, Concatenation code, Threshold theorem Libraries: Quantum computers and QC Simulators, Cirq, Qiskit, Forest, Quantum Development Kit

Textbooks:	
1.	Nielsen, M. A., & Chuang, I. L. (2010). *Quantum Computation and Quantum Information* (10th Anniversary ed.). Cambridge University Press.
2.	Rieffel, E. G., & Polak, W. H. (2011). *Quantum Computing: A Gentle Introduction*. MIT Press
3.	Hidary, J. D. (2021). *Quantum Computing: An Applied Approach* (2nd ed.). Springer. https://doi.org/10.1007/978-3-030-61601-4
Reference Books:	
1.	McMahon, D. (2008). *Quantum computing explained*. John Wiley & Sons.
2.	de Wolf, R. (2019). *Quantum Computing: Lecture Notes*. CWI Amsterdam and University of Amsterdam. Retrieved from https://homepages.cwi.nl/~rdewolf/qcnotes.pdf

e-Resources
GitHub - hywong2/Intro_to_Quantum_Computing: Class Slides for Introduction to Quantum Computing

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4111	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DEVOPS

(For CIC)

Pre-requisites: Software Engineering

Course Objectives: Students are expected to learn

1	Understand the core concepts of DevOps and its role in bridging development and operations.
2	Learn to use DevOps tools for version control, build automation, and continuous integration.
3	Explore continuous delivery and containerization using tools like Jenkins, Docker, and Kubernetes.
4	Implement infrastructure automation using configuration management tools such as Ansible.
5	Gain practical experience in setting up CI/CD pipelines and automating software deployment.

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

S. No	Outcome	Knowledge Level
1	Demonstrate an understanding of the DevOps lifecycle and apply its principles to optimize software development and delivery processes.	K3
2	Apply version control methods and automated testing techniques to manage source code effectively and ensure software quality.	K3
3	Infer the significance of Jenkins in automating build and deployment pipelines within the DevOps lifecycle.	K4
4	Categorize the components and functionalities of containerization and orchestration tools in the context of application deployment	K4
5	Analyze various configuration management and orchestration tools to understand their roles in infrastructure automation and deployment processes.	K4

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to DevOps and Agile Development:** Software Development Lifecycle (SDLC), Agile Methodology: Scrum & Kanban, DevOps Principles, Practices, and Benefits, DevOps Architecture and Lifecycle, Workflow, Value Stream Mapping, Bottlenecks, Introduction to CI/CD, Toolchains, **Introduction to DevOps Tools:** Jenkins, Git, Docker, Ansible, Kubernetes.
UNIT-II (10 Hrs)	**Version Control with Git and Automated Testing:** Source Code Management Concepts, Introduction to Version Control Systems (VCS), Git Features, Installation, and Workflow, Git Branching, Merging, Staging, and Collaboration, Unit Testing: JUnit, NUnit, Code Quality Analysis using SonarQube, Test Automation: Basics of Selenium, JavaScript testing frameworks.

UNIT-III (10 Hrs)	**Continuous Integration using Jenkins:** Introduction to Build Automation, Continuous Integration: Concepts & Importance, Jenkins Architecture and Installation, Jenkins Master-Slave Setup, Pipelines: Declarative vs Scripted, Build Triggers, User Management, Build Monitoring, Integration with Git, Test Tools, and Docker.
UNIT-IV (10 Hrs)	**Continuous Delivery & Containerization:** Difference between CI and CD, Continuous Delivery and Deployment Concepts, Docker Essentials: Installation, Images, Containers, Volumes, DockerFile, Docker Compose, DockerHub& Container Registry, Running and Publishing Containers, Container Testing and Monitoring
UNIT-V (10 Hrs)	**Configuration Management & Orchestration:** Infrastructure as Code (IaC), Ansible: Installation, Playbooks, Roles, Vaults, Deployment Automation using Ansible, Kubernetes Fundamentals: Pods, Services, ReplicaSets, Namespaces, Introduction to OpenShift (OCP): CI/CD on OpenShift, Deployments, Overview of Puppet & Chef (for comparative study)
TEXTBOOK:	
1.	**Joseph Joyner**, *DevOps for Beginners: DevOps Software Development Method Guide*, Mihails Konoplows, 2015.
2.	**Alisson Machado de Menezes**, *Hands-on DevOps with Linux*, 1st Edition, BPB Publications, India, 2021.
References:	
1.	Gene Kim, Jez Humble, Patrick Debois, John Willis**, *The DevOps Handbook*, IT Revolution Press, 2016.**
2.	Len Bass, Ingo Weber, Liming Zhu**, *DevOps: A Software Architect's Perspective*, Addison-Wesley.**
3.	Joakim Verona**, *Practical DevOps*, Packt Publishing, 1st & 2nd Editions.**
4.	Deepak Gaikwad, Viral Thakkar**, *DevOps Tools from Practitioner's Viewpoint*, Wiley Publications.**
Web Links:	
1.	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01338269041100390473 5_shared/overview [Software Engineering and Agile software development]
2.	https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501578194976768 10467 [Development & Testing with Agile: Extreme Programming]
3.	https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013538989171924992 26_shared [DevOps CICD]

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B20CI4112	PE	3	--	--	3	30	70	3 Hrs.

MACHINE LEARNING

(For CIC)

Course Objectives:

1.	Introduce the basic concepts and techniques of Machine Learning
2.	Demonstrate regression, classification and clustering methods.
3.	Introduce the concepts of dimensionality reduction, Regularization
4.	Illustrate the concepts of artificial neural networks and reinforcement learning

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

S.No	Outcome	Knowledge Level
1.	Use the concepts of Machine Learning and Feature Engineering	K3
2.	Apply Classification models on real world datasets	K3
3.	Apply Regression models and ensemble models	K3
4.	Demonstrate the concepts of Clustering, dimensionality reduction and regularization techniques,	K3
5.	Apply the concepts of artificial neural networks, reinforcement learning	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Machine Learning:** Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.
UNIT-II (10 Hrs)	**Supervised Learning:** Introduction to Proximity Measures, Distance Measures, and Non-Metric Similarity Functions, Proximity Between Binary Patterns. **Classification:** Different Classification Algorithms Based on the Distance Measures, Nearest Neighbors, Decision Trees, Naive Bayes, Binary Class classification and Multi Class classification, Logistic Regression.
UNIT-III (10 Hrs)	**Regression Models:** Linear Regression, SVM, Linear SVM, Kernel Trick. **Ensemble Learning:** Introduction, Voting Classifiers, Bagging, Random Forests, Boosting, AdaBoost, Gradient Boosting. XGBoost, Stacking.
UNIT-IV (10 Hrs)	**Unsupervised Learning Techniques:** Clustering, Types of Clustering, K-means clustering, and Hierarchical Clustering-Agglomerative Clustering,Divisive clustering, and

	Fuzzy C-Means Clustering. **Dimensionality Reduction & Regularization:** The Curse of Dimensionality, PCA, LDA, Lasso, Ridge.
UNIT-V (10 Hrs)	**Neurons, NNs, Linear Discriminants:** The Neuron, Neural Networks, The perceptron, **Multilayer perceptrons:** Going forwards, Going backwards, Backpropagation of error, Multilayer perceptron in practice, Examples of using MLP. **Reinforcement Learning:** Overview, Example, Markov Decision Process, Values, Q-Learning Algorithm, Uses of Reinforcement Learning.
Textbooks:	
1.	"Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024
2.	Introduction to Machine Learning, Alpaydin E, MIT Press (2014) 3rdEdition
3.	Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge, 2012
Reference Books:	
1.	Machine Learning: An algorithmic perspective, Stephen Marsland, 2nd edition, CRC press, 2014.
2.	The elements of statistical learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Second edition , Springer, 2009.
3.	Machine Learning in Action, Peter Harington, 2012, Cengage.
4.	Python Machine Learning Cookbook-Practical Solutions from Preprocessing to Deep Learning, Chris Albon, Oreilly, 2018.
5.	Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, Tensorflow, Sebastian Raschka, Vahid Mirjalili, Second edition, 2020
e-Resources	
1.	"Machine Learning" course by Andrew Ng on Coursera
2.	"Introduction to Machine Learning (IITKGP)" by Prof. Sudeshna Sarkar, on Swayam
3.	"Principal Component Analysis versus Linear Discriminant Analysis", https://medium.com/analytics-vidhya/illustrative-example-of-principalcomponent-analysis pcavs-linear-discriminant-analysis-lda-is-105c431e8907
4.	"Regularization in Machine Learning", https://towardsdatascience.com/regularization inmachine-learning76441ddcf99a
5.	Grid search for model tuning", https://medium.com/analyticsvidhya/illustrative-example ofprincipal-component-analysis-pca-vs-lineardiscriminant-analysis-lda-is-105c431e8907

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4113	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MOBILE AND WIRELESS SECURITY

(For CIC)

Course Objectives:

1.	To provide students with a foundational understanding of the security challenges in wireless and mobile communication systems, including the differences between wired and wireless security, the evolution of mobile communication technologies (e.g., GSM, 3G, 4G), and the security requirements for wireless and mobile networks.
2.	To enable students to evaluate security vulnerabilities and attacks in wireless networks (e.g., WLAN, MANETs, cellular networks) and mobile applications and to explore effective countermeasures and solutions.
3.	To equip students with the knowledge and skills to address security challenges in emerging technologies such as 5G, IoT, LiFi, and ubiquitous computing systems and to design novel security schemes for these environments.

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

S.No	Outcome	Knowledge Level
1.	Analyze the challenges and technologies related to building secure wireless and mobile systems.	**K4**
2.	Illustrate the methods by which wireless networks are compromised and the trade-offs in implementing security protocols.	**K3**
3.	Determine the vulnerabilities in cellular services, mobile applications, and sensor networks, and examine security strategies.	**K3**
4.	Illustrate the different security concerns in the design and operation of MANETs.	**K3**
5.	Demonstrate the basic concepts of wireless network security, privacy issues, and emerging technologies like Li-Fi.	**K3**

SYLLABUS

UNIT-I (10Hrs)	Introduction to Wireless Networks and Mobile Networks: Wireless Networks and its Architectures, Mobile Networks, Introduction to 2G, 3G and 4G networks, Wireless Algorithms, 6LOWPANNetwork, Mobile System Architectures.
UNIT-II (10 Hrs)	Wireless Network Security: Introduction to Wireless Networks Security, Overview of Cellular Systems, GSM and MTS Security & Attacks, Analysis of Threats and Application Requirements, WLAN security, Attacks on 802.11 networks.
UNIT-III (10 Hrs)	Security in Telecommunication Systems and Wireless Sensor Networks: Security in Cellular VoIPServices, SPIT Detection, Vulnerabilities in Cellular Services, Mobile

	Application Security, Ad-hocnetworks, Wireless Networks Security Components, 3G and 4G security, Securing Sensor Motes and Network.
UNIT-IV (10 Hrs)	Security in Mobile Application and Mobile Networks: Secure MANET Routing, Security Infrastructure for Wireless Mobile Networks: Keys and Certificate Management, Security of Mobile Codes, Malicious Mobile Applications, And Mobile BOTS.
UNIT-V (10 Hrs)	Limitations of Wireless Networks and its Security: Location Based Security & Privacy, Security inHybrid System, WIFI Vs LTE, Introduction to LiFi Security.
Textbooks:	
1.	K. Makki, S. Makki, P. Reiher et al., Mobile and Wireless Network Security and Privacy, Springer (1st Edition), Springer US, 2007. ISBN 978-0387710587.
2.	Jones Barlett,Sean Phillip, Wireless and Mobile Device Security (1st Edition), Jones & Bartlett Learning,2015. ISBN 978-1284059274.
Reference Books:	
1.	H. Chaouchi, M. Laurent, Wireless and Mobile Network Security, (1st Edition), Wiley, 2009. ISBN 978-1848211179.
e-Resources	
1.	https://csrc.nist.gov/publications
2.	https://csrc.nist.gov/publications

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4114	**SOC**	**1**	**--**	**2**	**2**	**--**	**50**	**3 Hrs.**

ETHICAL HACKING

(For CIC)

Course Objectives:

1.	Learn ethical hacking tools, vulnerability assessment tools and penetration testing.
2.	Understand common vulnerabilities in web applications and learn techniques to secure web servers and applications.
3.	Analyze network traffic in real-time, identifying and alerting on potential threats.

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

S.No	Outcome	Knowledge Level
1.	Apply different techniques for gathering information about websites.	K3
2.	Apply different tools for scanning vulnerabilities and capturing the traffic.	K3
3.	Develop simple malwares like keyloggers, viruses and Trojans.	K3
4.	Plan for web server hacking by different techniques.	K3
5.	Apply penetration testing using metasploit.	K3

SYLLABUS

UNIT-I (9.Hrs)	**Creating Environment:** Installing VMware, Setting Up Kali Linux, Using Kali Linux. **Foot printing and Reconnaissance:** Performing foot printing using Google Hacking, website information, information about an archived website, to extract contents of a website, to trace any received email, to fetch DNS information.
UNIT-II (9 Hrs)	**Scanning networks, Enumeration and sniffing:** Use port scanning. Network scanning tools, IDS tool, sniffing tool and generate reports. **Finding Vulnerabilities and Capturing Traffic:** Nessus and Wire Shark
UNIT-III (9 Hrs)	**Malware Threats: Worms, viruses, Trojans:** Use Password cracking, Dictionary attack, Encrypt and decrypt passwords, DoS attack, ARP poisoning in windows, Ifconfig, ping, netstat, traceroute, Steganography tools. **Developing and implementing malwares:** Creating a simple keylogger in python, creating a virus, creating a trojan.
UNIT-IV (9 Hrs)	**Hacking web servers, web applications:** Hacking a website by Remote File Inclusion, Disguise as Google Bot to view hidden content of a website, to use Kaspersky for Lifetime without Patch.

UNIT-V (9 Hrs)	**OWASP, Web Hacking:** SQL injection for website hacking, session hijacking. Cross site Scripting (XSS). **Pen Testing:** Penetration Testing using Metasploit and metasploitable.
Textbooks:	
1.	Penetration Testing by Georgia Weidman.
Reference Books:	
1.	The Complete Ethical Hacking Book: A Comprehensive Beginner's Guide to Learn and Master in Ethical Hacking by Thirumalesh.
e-Resources	
1.	https://www.tutorialspoint.com/ethical_hacking
2.	https://www.hackingarticles.in
3.	https://www.itperfection.com/ceh

Regulation: R20	IV / IV - B.Tech. II - Semester

CSE (IoT AND CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2022-23 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CI4201	Project Work (Project work, seminar and internship in industry)	PR	8	0	0	16	60	140	200
	TOTAL		**8**	**0**	**0**	**16**	**60**	**140**	**200**

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CI4201	**PR**	**--**	**--**	**16**	**8**	**60**	**140**	**3 Hrs.**

PROJECT WORK

(For CIC)

Course Objectives:

1.	To provide an opportunity to work in group on a topic / problem / experimentation.
2.	To encourage creative thinking process.
3.	To provide an opportunity to analyze and discuss the results to draw conclusions.
4.	To acquire and apply fundamental principles of planning and carrying out the work plan of the project through observations, discussions and decision-making process.

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

S.No	Outcome	Knowledge Level
1.	Identify a current problem through literature/field/case studies	K3
2.	Identify the objectives and methodology for solving the problem	K3
3.	Design and Develop technology/process for solving the problem	K4
4.	Evaluate the technology/process	K5

*The object of Project Work is to enable the student to take up investigative study in the broad fields ofInternet of Things, Cyber Security and Blockchain Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a supervisor. This is expected to provide a good initiation for the
student(s) in R&D work.

The assignment to normally include:
a) Survey and study of published literature on the assigned topic.
b) Working out a preliminary approach to the problem relating to the assigned topic.
c) Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility.
d) Preparing a written report on the study conducted for presentation to the department.
e) Final Seminar, as oral Presentation before a departmental committee.