SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)

(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade.
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	**III / IV - B.Tech. I – Semester**

CSE (IoT and Cyber Security including Blockchain Technology)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23CI3101	Designing the IOT	PC	3	0	0	3	30	70	100
B23CI3102	Cyber Security and Digital Forensics	PC	3	0	0	3	30	70	100
B23CI3103	Cryptography & Network Security	PC	3	0	0	3	30	70	100
#PE-I	Professional Elective-I	PE	3	0	0	3	30	70	100
#OE-I	Open Elective- I	OE	3	0	0	3	30	70	100
B23CI3109	Internet of Things Lab	PC	0	0	3	1.5	30	70	100
B23CI3110	Cyber Security Lab	PC	0	0	3	1.5	30	70	100
B23BS3101	Soft Skills	SEC	0	1	2	2	30	70	100
B23CI3111	Tinkering Lab *(User Interface Design using Flutter)* / SWAYAM Plus - Android Application Development (with Flutter)	ES	0	0	2	1	30	70	100
B23CI3112	Evaluation of Community Service Internship	PR	--	--	--	2	--	50	50
		Total	**15**	**1**	**10**	**23**	**270**	**680**	**950**

	Course Code	Course
#PE-I	B23CI3104	Automata Theory & Compiler Design
	B23CI3105	Artificial Intelligence
	B23CI3106	Microprocessors & Microcontrollers
	B23CI3107	Lightweight Cryptography
	B23CI3108	MOOCS-I
#OE-I	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3101	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

DESIGNING THE IOT

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Understand the architecture and fundamental components of IoT systems.
2.	Acquire knowledge on data acquisition, sensing, and communication methods in IoT.
3.	Develop skills in prototyping and programming embedded IoT devices.
4.	Explore real-time operating systems and IoT development tools.
5.	Understand IoT security threats and domain-specific applications.

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

S. No	OUT COME	Knowledge Level
1.	**Apply** knowledge of IoT components and compare with traditional systems.	K3
2.	**Demonstrate** data acquisition, sensor interfacing, and communication methods in IoT.	K3
3.	**Develop** embedded applications using C and Python for IoT-based solutions.	K4
4.	**Analyze** real-time operating systems (RTOS) for multitasking and scheduling in IoT.	K4
5.	**Design** and prototype a domain-specific IoT solution considering security and tools.	K4

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to IoT & Design Principles** **Basics of IoT:** Definition, characteristics, and applications, Evolution of Internet, cloud, mobile computing, IoT Architecture: Perception, Network, Middleware, Application layers **Design Principles:** Modularity, scalability, interoperability, reliability, Data acquisition and organization, Data analytics for IoT
UNIT-II (10 Hrs)	**Prototyping Hardware for IoT** **Basic electronics for IoT:** Microcontrollers vs Microprocessors, **Sensors and actuators:** Types, interfacing, and usage, **Wireless communication modules** (WiFi, ZigBee, Bluetooth, LoRa), **IoT Gateways and protocols** (MQTT, CoAP), Edge computing concept, **Software components:** OS, firmware, middleware.

UNIT-III (10 Hrs)	**Embedded Programming for IoT** **Programming models for IoT:** Event-driven, multithreaded, Programming with C and Python, Sensor data acquisition and handling, Communication protocol implementation **Case Studies:** Temperature control system, Smart irrigation, Home automation
UNIT-IV (10 Hrs)	**Real-Time Operating Systems for IoT** Concept of RTOS, task scheduling, context switching, Multitasking, semaphores, mutexes, and signals, **RTOS services:** Timers, interrupts, priority handling. Nucleus SE RTOS architecture, RTOS initialization and task startup.
UNIT-V (10 Hrs)	**IoT Tools, Devices, and Security** **Introduction to configuration tools:** Chef, Puppet, Ansible. Device management with NETCONF and YANG, Basic building blocks of IoT physical devices, **Popular Devices:** pcDuino, BeagleBone Black, Raspberry Pi, Arduino, Cubieboard, **Domain-Specific IoTs:** Healthcare, Smart Cities, Industrial IoT, **IoT Security:** Threats, authentication, data integrity, secure communication.
Text Books:	
1.	Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2.	Internet of Things: Architecture and Design Principles by Raj Kamal, McGraw Hill Educati private limited, 2017.
Reference Books:	
1.	Hanes, Salgueiro et al. – *IoT Fundamentals*, Cisco Press, 2017.
2.	Olivier Hersent et al. – *The Internet of Things*, Wiley, 2012.
3.	Adrian McEwen, Hakim Cassimally – *Designing the Internet of Things*, Wiley, 2014
e-Resources:	
1.	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/preview
2.	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot
3.	Online Resources: AWS IoT Docs, Azure IoT Hub, LoRaWAN Academy, Blynk Docs https://docs.aws.amazon.com/iot/ https://cloud.google.com/iot/docs https://www.thethingsnetwork.org/docs/ https://firebase.google.com/docs/iot

SRKR ENGINEERING COLLEGE AUTONOMOUS Estd 1980

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3102	PC	3	--	--	3	30	70	3 Hrs.

CYBER SECURITY AND DIGITAL FORENSICS

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Identify types of cybercrimes and take preventive steps.
2.	Understand the forensics fundamentals
3.	Apply the evidence capturing process
4.	Analyze the preservation of digital evidence

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

S. No	Outcome	Knowledge Level
1.	**Apply** the fundamental concepts of cybercrime to identify social engineering and property cybercrime.	K3
2.	**Analyze** various forms of cybercrime and assess the role of law enforcement.	K4
3.	**Analyze** digital evidence in cybercrime cases involving emails, encryption, and data recovery.	K4
4.	**Apply** computer forensics tools and techniques to investigate digital evidence	K3
5.	**Apply** relevant legal frameworks to assess and address cybercrime issues	K3

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, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands-on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

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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)	**Laws and Acts:** Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, IPC and CrPC, Electronic Communication Privacy ACT, Legal Policies.
Text Books:	
1.	Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2.	Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics", Tata McGraw-Hill, New Delhi, 2006.
Reference Books:	
1.	Robert M Slade, "Software Forensics", Tata McGraw-Hill, New Delhi, 2005.
2.	Bernadette H Schell, Clemens Martin, "Cybercrime", ABC–CLIO Inc, California, 2004.
3.	"Understanding Forensics in IT", NIIT Ltd, 2005.
4.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
e-Resources:	
1.	https://www.netacad.com/courses/introduction-to-cybersecurity?courseLang=en-US
2.	CERT-In Guidelines- http://www.cert-in.org.in/
3.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
4.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]

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Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3103	PC	3	0	0	3	30	70	3Hrs.

CRYPTOGRAPHY AND NETWORK SECURITY

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Overview of computer security and classical encryption techniques.
2.	Working principles and utilities of various cryptographic algorithms including symmetric key cryptography and public key cryptography algorithms.
3.	Design issues and working principles of hashing, message digest algorithms and various authentication protocols.
4.	Various secure communication protocols standards and Concepts of firewalls.

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

S. No	Outcome	Knowledge Level
1.	Illustrate various types of Security attacks, services, mechanisms and Block Cipher Structure.	K2
2.	Apply Symmetric Key, Public Key Cryptography techniques to achieve confidentiality service.	K3
3.	Apply Cryptographic Hashing algorithms and Digital algorithms to achieve Integrity and authentication service.	K3
4.	Apply Email, IP security protocols to achieve User Authentication and confidentiality.	K3
5.	Use firewall configuration and Transport level security protocols to protect our data.	K3

SYLLABUS

UNIT-I (10Hrs)	**Classical Encryption Techniques:** Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Web Based Attacks, Phishing Attacks, , SQL Injection Attacks, Substitution techniques, Transposition techniques, **Block Ciphers:** Traditional Block Cipher Structure, Block Cipher Modes of Operations.
UNIT-II (10 Hrs)	**Symmetric Key Cryptography:** Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, **Stream ciphers:** RC4, RC5. **Public Key Cryptography:** Principles, Public Key Cryptography Algorithms, RSA

	Algorithm, Diffie Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.
UNIT-III (10Hrs)	**Cryptographic Hash Functions:** Application of Cryptographic Hash Functions, Requirements & Security, SHA-512, MD5, Message Authentication Functions, Requirements & Security, HMAC & CMAC. **Digital Signatures:** Digital Signature Algorithm, DSS with RSA, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm.
UNIT-IV (10 Hrs)	**User Authentication:** Remote User Authentication Principles, Kerberos, X.509 certificate. **Electronic Mail Security:** Pretty Good Privacy (PGP) And S/MIME. **IP Security:** IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload and Key Management: OAKLEY, ISAKMP.
UNIT-V (10 Hrs)	**Transport Level Security:** Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS) **Firewalls:** Characteristics, Types of Firewalls, Firewall Configuration, Trusted Systems.
Text Books:	
1.	Cryptography and Network Security – Principles and Practice, William Stallings, 7/e. Pearson Education, 2017
2.	Cryptography and Network Security- Behrouz A Forouzan, DebdeepMukhopadhyaya, McGrawHill, 3rd Edition, 2015
Reference Books:	
1.	Neal Koblitz, A Course in Number Theory and Cryptography: Springer- Verlag, New York Inc.May 2001.
2.	Atul Kahate, Cryptography and Network Security, 4/e, McGraw Hill, 2019
e-Resources:	
1.	https://www.coursera.org/learn/crypto
2.	https://cheatsheetseries.owasp.org/

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3104	PE	3	--	--	3	30	70	3 Hrs.

AUTOMATA THEORY & COMPILER DESIGN

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Construct appropriate Automata for the formal languages
2.	Understand the importance and applications of FA and RE in Compiler Design
3.	Construct output of different phases of compilers

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Construct** Finite Automata and Understand different phases of compiler	K3
2.	**Construct** RE, Design lexical analyzers	K3
3.	**Construct** parse trees and simple parsers	K3
4.	**Construct** PDA and powerful LR parsers	K5
5.	**Construct** TM and intermediate code.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Automata Theory:** Central Concepts of Automata theory, Deterministic Finite Automata (DFA), Non- Deterministic Finite Automata (NFA), Epsilon- NFA, NFA to DFA Conversion, Minimization of DFA. **Introduction to Compiler Design:** Language Processors, Phases of Compilers.
UNIT-II (10 Hrs)	**Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions, Proving Languages Not to Be Regular. **Lexical Analysis Phase of compiler Design:** Role of Lexical Analyzer, Input Buffering, Specification of Token, Recognition of Token.
UNIT-III (10 Hrs)	**Context Free Grammars:** Definition and designing CFGs, Derivations Using a Grammar, Parse Trees, Ambiguity and Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring. **Syntax Analysis Phase of Compilers: part-1:** Role of Parser, Top-Down Parsing
UNIT-IV (10 Hrs)	**Push Down Automata:** Definition of the Pushdown Automata, The Languages of a PDA. **Syntax Analysis Phase of Compilers:** Part-2: Bottom-up Parsing, Introduction to LR Parsing: SLR, More Powerful LR parsers

UNIT-V (10Hrs)	**Introduction to Turing Machine:** Problems that Computers Cannot Solve, The Turing machine, problems, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine **Undecidability:** A language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE. **Other Phases of Compilers:** Syntax Directed Translation- Syntax-Directed Definitions, Evaluation Orders for SDD's. Intermediate-Code Generation- Variants of Syntax Trees, Three-Address Code. **Code Generation-**Issues in the Design of a Code Generator

Text Books:	
1.	John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Third Edition, Pearson.
2.	Alfred V.Aho, Monica S.Lam, RaviSethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", Second Edition, Perason
ReferenceBooks:	
1.	Elain Rich, "Automata, Computability and complexity", 1st Edition, Pearson Education,2018.KMuneeswaran, "Compiler Design", Oxford University Press 2013.
2.	K.L.P Mishra, N Chandrashekaran, 3rd Edition, 'Theory of Computer Science", PHI,2012.
3.	Peter Linz, "An introduction to Formal Languages and Automata ", 3rd Edition, Narosa Publishers,1998
4	K Muneeswaran, "Compiler Design", Oxford University Press 2013

e-Resources:	
1.	https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
2.	https://www.geeksforgeeks.org/introduction-of-compiler-design/

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3105	PE	3	--	--	3	30	70	3 Hrs.

ARTIFICIAL INTELLIGENCE

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	This course introduces students to the basic knowledge representation, problem solving, and learning methods of artificial intelligence.

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Summarize** different AI problems, characteristics and state space representation	K2
2.	**Apply** heuristic, uninformed and informed search strategies for solving AI problems	K3
3.	**Apply** constraint satisfaction techniques to solve the AI problems	K3
4.	**Apply** AI problem solving approaches to predicate logic representation of knowledge	K5
5.	**Summarize** different planning approaches and expert systems	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction, Overview of Artificial intelligence:** Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. **Problem Solving, Problems, Problem Space & search:** Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.
UNIT-II (10 Hrs)	**Search techniques:** Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search
UNIT-III (10 Hrs)	**Constraint satisfaction problems:** Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

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UNIT-IV (10 Hrs)	**Knowledge & reasoning:** Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.
UNIT-V (10Hrs)	**Probabilistic reasoning:** Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques **Expert Systems:** Representing and using domain knowledge, expert system shells, and knowledge acquisition. **Home Assignments:** Assignments should include problems related to the topics covered in lectures, like heuristics, optimal search, and graph heuristics. Constraint satisfaction problems, k-nearest neighbors, decision trees, etc. can be included in home assignments.

Text Books:	
1.	Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach
2.	Artificial Intelligence, Russel, Pearson
Reference Books:	
1.	Artificial Intelligence, Ritch & Knight, TMH
2.	Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3.	Logic & Prolog Programming, Saroj Kaushik, New Age International
4	Expert Systems, Giarranto, VIKAS
e-Resources:	
1.	https://skillsbuild.org/students/course-catalog/artificial-intelligence
2	https://www.coursera.org/courses?query=artificial%20intelligence

SRKR ENGINEERING COLLEGE Estd 1980

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3106	PE	3	--	--	3	30	70	3 Hrs.

MICROPROCESSORS & MICROCONTROLLERS

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	To understand the basics of microprocessors and microcontrollers architectures and its functionalities.
2.	To create an exposure to basic peripherals, its programming and interfacing techniques.
3.	To understand the concepts of ARM processor.

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Understand** the Architecture, Instruction set and Internal organization of 8086 microprocessors.	K2
2.	**Develop** the assembly language programming techniques regarding 8086 Microprocessor.	K3
3.	**Identify** the different I/O Peripherals (8255 and 8279) which are interfaced with 8086 Microprocessor.	K2
4.	**Analyze** the architecture and functional units of 8051 microcontroller.	K3
5.	**Develop** the assembly language programming techniques regarding 8051 and basic fundamentals of ARM processor.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to 8086 microprocessors**: Architecture of 8086 Microprocessor, pin description of 8086 microprocessor, Minimum and Maximum mode of operation of 8086 microprocessor, addressing modes in 8086 microprocessors.
UNIT-II (10 Hrs)	**Assembly Language programming of 8086:** Assembler directives and Instruction set of 8086 microprocessor, Assembly language programming examples on data transfer and data conversions
UNIT-III (12 Hrs)	**I/O Interface**: 8255 PPI, Various Modes of Operation and Interfacing to 8086, D/A and A/D Converter, Stepper motor, Interfacing of DMA controller 8257.Memory Interfacing to 8086. **Communication Interface**: Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

UNIT-IV (10 Hrs)	**Introduction To Microcontrollers:** Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs.
UNIT-V (08 Hrs)	**8051 Real Time Control:** Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters. **Arm Processor:** Fundamentals, Registers, Current program status register, Architecture and pipeline.

Text Books:	
1.	Advanced Microprocessors and Peripherals, A K RAY & K M Bhurchandi, 2nd Edition,The Mcgraw-Hill companies.
2.	The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3.	ARM System Developer's Guide: Designing and Optimizing System Software- Andrew N. Sloss, Dominic Symes, Chris Wright, Elsevier Inc.,2007.
Reference Books:	
1.	The 80X86 Family, Design, Programming and Interfacing, John E. Offenbach, 3rd Edition, Pearson Education Inc., 2002.
2.	Walter A. tribal and Avatar Singh. The 8088 and 8086 Microprocessors, Programming Interfacing, Software, Hardware and Applications, 4th Edition Pearson education Inc., 2003
3.	Microprocessors and Interfacing. Programming and hardware, 2nd Edition, Douglass V. Hall. MH Edition, 1999.
4.	Kenneth. J. Ayala, The 8051 Microcontroller, 3rd Ed., CengageLearning.
5.	The 8051 Microcontroller and Embedded systems using assembly and CMPearson 2nd edition 2006.
e-Resources:	
1.	https://ocw.mit.edu/courses/6-004-computation-structures-spring-2017/
2.	https://developer.arm.com/Processors/Cortex-M

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3107	PE	3	--	--	3	30	70	3 Hrs.

LIGHT WEIGHT CRYPTOGRAPHY

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Gain in-depth knowledge on Lightweight Cryptography and its relation to the new security in RFID tags.
2.	Apply proactive and defensive measures to counter potential threats, attacks and the intrusions.

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Explain** Crypto graphic based solutions, attacks and intrusions.	K2
2.	**Demonstrate** security and privacy issues in radio frequency identification (RFID) systems	K2
3.	**Explain** multiple ways to attack and defend in the industrial systems.	K2
4.	**Develop** cryptographic solutions for product specific security.	K3
5.	**Develop** low-cost cryptographic solutions for application involving RFID	K3

SYLLABUS

UNIT-I (10Hrs)	Anti-counterfeiting and RFID - Anti-Counterfeiting and Supply Chain Security, Networked RFID Systems, PC Network Architecture, A Security Primer.
UNIT-II (10 Hrs)	Security and Privacy Current Status - Addressing Insecurities and Violations of Privacy, RFID Tag Vulnerabilities in RFID Systems, From Identification to Authentication – A Review of RFID Product Authentication Techniques.
UNIT-III (10 Hrs)	Network-Based Solutions-EPC System for a Safe & Secure Supply Chain and How it is Applied, The Potential of RFID and NFC in Anti-Counterfeiting, Improving the Safety and Security of the Pharmaceutical Supply Chain.
UNIT-IV (10 Hrs)	Cryptographic Solutions - Product Specific Security Based on RFID Technology, Strengthening the Security of Machine-Readable Documents, Enhancing Security of Class I Generation 2 RFID against Traceability and Cloning.

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UNIT-V (10 Hrs)	Low-cost Cryptographic Solutions: A Random Number Generator for Application in RFID Tags, A Low-Cost Solution to Cloning and Authentication Based on a Lightweight Primitive, Lightweight Cryptography for LowCost RFID.
Text Books:	
1.	Networked RFID Systems and Light weight Cryptography by Peter H. Cole Damith C. Ranasinghe First edition, Springer publication, 2008.
Reference Books:	
1.	RFID Security and Privacy by Yingjiu Li, Robert H. Deng.
2.	RFID Hand Book by Klaus Finkenzeller, Third edition, Wiley Publications.
e-Resources:	
1.	https://www.lightweightcrypto.org/
2.	https://lasec.epfl.ch/teaching/lwc/

Estd. 1980
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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3109	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

IOT LAB

(For CIC)

Course Objectives: This course aims to equip students with the following:

1	To Understand the basics of IoT, microcontrollers (Arduino & ESP32), and their programming environment.
2	To Interface sensors and actuators with microcontrollers.
3	To Develop simple IoT applications using Arduino and ESP32.
4	To Send sensor data to web/cloud platforms like Thing speak or Firebase.
5	To Control devices remotely using mobile apps or web servers.

Course Outcomes: At the end of the Course Student will be able to

S. No	Outcome	Knowledge Level
1	**Identify** and use suitable microcontrollers and sensors for IoT applications.	K3
2	**Develop** programs to read sensor data and control actuators using Arduino/ESP32.	K3
3	**Design** and simulate basic IoT applications with real-time data monitoring.	K4
4	**Interface** IoT devices with cloud services or mobile apps.	K3
5	**Build** and demonstrate a working prototype for a real-life IoT problem.	K6

SYLLABUS

Part A: Arduino-Based Experiments

1	Blink an LED using Arduino
2	Interfacing a push button to control an LED
3	Read temperature and humidity using DHT11 sensor
4	Measure distance using Ultrasonic sensor
5	Interfacing Soil Moisture sensor and display value on Serial Monitor
6	Display sensor data on a 16x2 LCD using Arduino
7	Control a servo motor with Arduino
8	Operate a bulb or fan using a relay module

Part B: ESP32-Based Experiments

1	Blink LED using ESP32
2	Create a web server with ESP32 to control LED

3	Read DHT11 sensor values and display on web page (hosted by ESP32)
4	Send sensor data to Thingspeak or Firebase using ESP32
5	Control LED or read sensor data using Blynk App and ESP32
Part C: Mini Project (Choose One)	
1.	Smart Irrigation System
2	IoT-Based Health Monitor
3.	Intruder Alert System
4.	Home Automation System
Reference Books:	
1	**Internet of Things** – Arshdeep Bahga, Vijay Madisetti, 1st Edition, Universities Press
2	**Getting Started with Arduino** – Massimo Banzi & Michael Shiloh, Maker Media
3	**Internet of Things with ESP8266** – Marco Schwartz, Packt Publishing

Estd. 1980
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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3110	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

CYBER SECURITY LAB

(For CIC)

Course Objectives: This course aims to equip students with the following:

1	Demonstrate network monitoring tools.
2	Design and Deploy Traps to identify intruders' behavior.
3	Perform Cyber threat intelligence Operations.

Course Outcomes: At the end of the Course Student will be able to

S. No	Outcome	Knowledge Level
1	**Perform** network scanning to identify cyber threats/attacks.	K3
2	**Design** and deploy basic network security traps.	K4
3	**Able** to use Autopsy tools.	K3
4	**Perform** Memory capture and analysis.	K3
5	**Demonstrate** Network analysis using Network miner tools.	K3

SYLLABUS

1	Perform an Experiment for port scanning with nmap
2	Set up a honeypot and monitor the honeypot on the network
3	Install Jscript/Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.
4	Generate minimum 10 passwords of length 12 characters using openSSL command
5	Perform practical approach to implement Footprinting - Gathering target information using DmitryDmagic, UA tester
6	Work with sniffers for monitoring network communication (Wireshark).
7	Using Snort, perform real-time traffic analysis and packet logging.
8	Perform email analysis using the Autopsy tool
9	Perform Registry analysis and get boot time logging using process monitor tool
10	Perform File type detection using Autopsy tool
11	Perform Memory capture and analysis using FTK imager tool
12	Perform Network analysis using the Network Miner tool

Reference Books:

1.	Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.

2	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
3	Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
4	Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012.
5	The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A. Reyes, Syngress, 2007.
e-Resources:	
1	https://medium.com/@ecojumper30/creating-a-honeypot-f2b4cc33385a
2	https://www.snort.org/documents
3	https://www.geeksforgeeks.org/analysis-of-data-source-using-autopsy/
4	https://www.exterro.com/uploads/documents/FTK_7.4.2_UG.pdf

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS3101	SEC		1	2	2	30	70	3 Hrs.

SOFT SKILLS

(For AIDS, CIC, CSIT, CSD, ECE and EEE)

Course Objectives:

1	To familiarise students with soft skills and how they influence their professional growth.
2	To build/refine the professional qualities/skills necessary for a productive career and to instill confidence through attitude building.

Course Outcomes:

S.No	Outcome	Knowledge Level
1	Interpret the essence of key soft skills such as creativity & problem solving, emotional intelligence, leadership qualities, etc.	K2
2	Outline interview essentials for graduate-job prospects.	K2
3	Apply presentation skills in academic and professional settings.	K3
4	Demonstrate knowledge about domain specific industry and the prospective workplace.	K2

SYLLABUS

1	**INTRODUCTION** Introduction to soft skills, definition and meaning, importance and need in personal and professional settings; soft skills vs. hard skills; personality development.
2	**INTRA-PERSONAL AND INTER-PERSONAL COMMUNICATION** Significance of Inter & Intra-Personal Communication; SWOT Analysis; Goal Setting – Guidelines for Goal Setting; Emotional Intelligence; Creativity & Problem Solving; Stress and Time Management; Leadership & Team Work; Building a positive attitude, Social Consciousness.
3	**WRITTEN COMMUNICATION** Resume Preparation: Common resume blunders, Tips for betterment, Resume Review; Report Writing; Writing an SOP (Statement of purpose).
4	**PRESENTATION SKILLS** Importance of Presentation Skills; JAM; Essential guidelines for Group Discussions; Debates; Role Plays; PPTs etc.

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5	**INTERVIEW SKILLS** Employability Skills: Knowing about Selection Process; Interview Skills, types of Interviews, E-Interviews, Do's and Don'ts of Interviews, FAQs, Mock Interviews; Awareness about Industries; Importance of researching the prospective workplace.
Text Books:	
1	Sherfield, M. Robert et al, Cornerstone Developing Soft Skills,(4th edition), Pearson Publication, New Delhi, 2014.
2	Alka Wadkar, Life Skills for Success,(1st edition), Sage Publications India Private Limited, 2016.
3	Soft Skills : Know Yourself and Know the World by Dr. K. Alex, S. Chand & Company Ltd., New Delhi, 2009.
Reference Books:	
1	Sambaiah.M. Technical English, Wiley Publishers India. New Delhi. 2014.
2	Gangadhar Joshi, From Campus to Corporate, SAGE TEXT, 2015.
3	Alex.K, Soft Skills, 3rd ed. S. Chand Publication, New Delhi, 2014.
4	Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principle and Practice, Oxford University Press, 2009.
5	Emotional Intelligence by Daniel Goleman, Random House Publishing Group, 2012.

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3111	**ES**	**--**	**--**	**2**	**1**	**30**	**70**	**3 Hrs.**

TINKERING LAB (USER INTERFACE DESIGN USING FLUTTER)

(For CSE)

Course Objectives: This course aims to equip students with the following:

1.	To understand and apply the fundamentals of Dart programming and Flutter framework setup.
2.	To explore and implement core Flutter widgets, layouts, and responsive UI design techniques.
3.	To develop interactive mobile applications using navigation, state management, and custom widgets.
4.	To integrate animations, form handling, REST API communication, and testing in Flutter applications.

Course Outcomes: At the end of the Course Student will be able to

S. No	Outcome	Knowledge Level
1.	**Learn** the basics of Dart language and Flutter tools to design apps that work on multiple platforms with organized screens and visual elements.	K2
2.	**Use** Flutter features like buttons, layouts, page switching, and data handling to build user-friendly and dynamic interfaces.	K3
3.	**Create** real-time apps by connecting to web services, managing forms, adding motion effects and personalized elements, and checking and fixing issues in Flutter apps.	K4

SYLLABUS

1.	**Week 1: Setup and Dart Basics** **a)** Install Flutter SDK and Dart environment. **b)** Write simple Dart programs to understand variables, control structures, and functions.
2.	**Week 2: Exploring Flutter Widgets** **a)** Explore basic Flutter widgets like *Text, Image, Container, Icon*, etc. **b)** Create simple UI layouts using *Row, Column*, and *Stack*.
3.	**Week 3: Layouts and UI Design** **a)** Implement advanced layout strategies with *Expanded, Flexible*, and nested widgets. **b)** Design a clean UI screen using composition and layout principles.
4.	**Week 4: Responsive Design** **a)** Create responsive UI that adapts to screen sizes using *MediaQuery* and *LayoutBuilder*. **b)** Implement breakpoints and scalable layouts for tablets and phones.
5.	**Week 5: Navigation and Routing** **a)** Set up navigation between multiple screens using *Navigator* and *Navigator.push.*

	b) Use named routes and pass data between screens.
6.	**Week 6: State Management & Theming** **a)** Compare and implement *StatelessWidget* and *StatefulWidget*. **b)** Use *Provider* for simple state management. **c)** Apply app-wide theming with *ThemeData* and custom styles.
7.	**Week 7: Forms and API Integration** **a)** Design a form with input fields (TextField, Dropdown, Switch). **b)** Validate input and handle errors. **c)** Fetch and display data from a REST API.
8.	**Week 8: Animations and Testing** **a)** Add basic animations using *AnimatedContainer*, *AnimatedOpacity*, etc. **b)** Write unit tests for widgets and use Flutter DevTools for debugging.
9.	**Week 9: Mini Project** **Objective:** Build a fully functional Flutter app that includes: • Multiple screens with navigation • State management using Provider • REST API integration (e.g., Weather, News, or User Data) • Form with validation • Basic animation and theming **Examples:** To-do app, Weather app, Movie list app, Student form with database.
Text Books:	
1.	*Beginning Flutter: A Hands-On Guide to App Development* – Marco L. Napoli, Wiley, 2020.
2.	*Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2* – Alessandro Biessek, Packt Publishing, 2020.
Reference Books:	
1.	*Flutter Recipes: Mobile Development Solutions for iOS and Android* – Fu Cheng, Apress, 2019.
2.	*Flutter in Action* – Eric Windmill, Manning Publications, 2020.
3.	*Flutter & Dart Cookbook: Developing Full-Stack Applications for the Cloud* – Richard Rose, O'Reilly Media, 2021.
e-Resources	
1.	https://www.udemy.com/course/flutter-bootcamp-with-dart/?couponCode=LEARNNOWPLANS
2.	https://www.coursera.org/learn/flutter-and-dart-developing-ios-android-mobile-apps

Regulation: R23	**III / IV - B.Tech. II – Semester**

CSE (IoT and Cyber Security including Blockchain Technology)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23CI3201	Wireless Sensor Networks	PC	3	0	0	3	30	70	100
B23CI3202	Cloud Computing	PC	3	0	0	3	30	70	100
B23CI3203	Block chain Technology	PC	3	0	0	3	30	70	100
#PE-II	Professional Elective-II	PE	3	0	0	3	30	70	100
#PE-III	Professional Elective-III	PE	3	0	0	3	30	70	100
#OE-II	Open Elective- II	OE	3	0	0	3	30	70	100
B23CI3214	Cloud computing Lab	PC	0	0	3	1.5	30	70	100
B23CI3215	Block chain Technology Lab	PC	0	0	3	1.5	30	70	100
B23CI3216	Full Stack Development-II	SEC	0	1	2	2	30	70	100
B23AC3201	Technical Paper Writing & IPR	AC	2	--	--	--	30	--	30
B23MC3201	Employability Skills	MC	2	--	--	--	30	--	30
		Total	**20**	**1**	**8**	**23**	**270**	**630**	**900**

	Course Code	Course
#PE-II	B23CI3204	Software Engineering
	B23CI3205	Mobile Adhoc Networks
	B23CI3206	Public Block chain – Ethereum
	B23CI3207	Security Assessment and Risk Analysis
	B23CI3208	MOOCS-II
#PE-III	B23CI3209	Machine Learning
	B23CI3210	Software Project Management
	B23CI3211	DevOps
	B23CI3212	Natural Language Processing
	B23CI3213	MOOCS-III
#OE-II	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	
*Mandatory Industry Internship /Mini Project of 08 weeks duration during summer vacation		

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3201	PC	3	--	--	3	30	70	3 Hrs.

WIRELESS SENSOR NETWORKS

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	To acquire the knowledge about various architectures and applications of Sensor Networks
2.	To understand issues, challenges, and emerging technologies for wireless sensor networks
3.	To learn about various routing protocols and MAC Protocols
4.	To understand various data gathering and data dissemination methods
5.	To study about design principles, node architectures, hardware, and software required for implementation of wireless sensor networks.

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

S. No	Outcome	Knowledge Level
1.	**Understand** the fundamentals, constraints, and applications of Wireless Sensor Networks.	K2
2.	**Study** characteristics of MANETs & WSNs and identify key issues in WSN deployment.	K3
3.	**Apply** routing & MAC protocols for efficient WSN communication considering energy & bandwidth constraints	K3
4.	**Demonstrate** data dissemination, QoS, and implement security mechanisms in sensor networks	K3
5.	**Explain** WSN architectures, understand gateway communication, and OS constraints in resource-limited devices.	K3

SYLLABUS

UNIT-I (10Hrs)	Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks
UNIT-II (10 Hrs)	Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks
UNIT-III (10 Hrs)	Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT-IV (10 Hrs)	Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.
UNIT-V (10 Hrs)	Design Principles for WSNs, Gateway Concepts, Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC
Textbooks:	
1.	Ad-Hoc Wireless Sensor Networks - C. Siva Ram Murthy, B.S. Manoj, Pearson
2.	Principles of Wireless Networks – Kaveh Pahlavan and P. Krishna Murthy, 2002, PE
Reference Books:	
1.	Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2.	Wireless Communications - Andrea Goldsmith, 2005, Cambridge University Press.
3.	Mobile Cellular Communication – GottapuSasibhushana Rao, Pearson Education, 2012
4.	Wireless Communication and Networking – William Stallings, 2003, PHI
e-Resources	
1.	https://nptel.ac.in/courses/106105160
2.	https://www.edx.org/learn/technology/university-of-notre-dame-understanding-wireless-technology-economics-and-policy
3.	https://www.coursera.org/learn/wireless-communications

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3202	PC	3	--	--	3	30	70	3 Hrs.

CLOUD COMPUTING

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Understanding cloud computing models, architectures, and core services along with their deployment strategies.
2.	Exposure to enabling technologies such as distributed computing, virtualization, and containers in cloud environments.
3.	Familiarity with technical challenges and security considerations in cloud adoption.
4.	Awareness of advanced trends in cloud computing including serverless, edge, and fog computing.

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

S.No	Outcome	Knowledge Level
1.	**Apply** cloud architecture, service models, and deployment models to practical computing scenarios.	K3
2.	**Analyze** the role of distributed and parallel architectures in cloud computing.	K4
3.	**Demonstrate** the use of virtualization and containers in cloud resource provisioning.	K3
4.	**Analyze** technical challenges in cloud computing such as security, scalability, and interoperability.	K4
5.	**Use** serverless and edge/fog computing concepts to optimize performance and cost-efficiency in cloud-based systems.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Cloud Computing Fundamentals:** Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine).
UNIT-II (10 Hrs)	**Cloud Enabling Technologies:** Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), web services, virtualization.

UNIT-III (10 Hrs)	**Virtualization and Containers:** Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.
UNIT-IV (10 Hrs)	**Cloud computing challenges:** Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, security in cloud deployment models.
UNIT-V (10 Hrs)	**Advanced concepts in cloud computing:** Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, edge and fog computing.

Textbooks:	
1.	Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, ShivanandaPoojara, Satish N. Srirama, Mc Graw Hill, 2024.
2.	Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
Reference Books:	
1.	Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2.	Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3.	Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)
4.	Docker, Reference documentation, https://docs.docker.com/reference/
5.	OpenFaaS, Serverless Functions Made Simple, https://docs.openfaas.com/
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs17/preview

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Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3203	PC	3	--	--	3	30	70	3 Hrs.

BLOCKCHAIN TECHNOLOGY

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	To learn the fundamentals of Block Chain and various types of block chain and consensus mechanism.
2.	To understand public block chain system, Private block chain system and consortium block chain.
3.	Able to know the security issues of blockchain technology.

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Explain** the fundamental concepts of the Block chain technology.	K2
2.	**Demonstrate** public block chain system concepts and the smart contracts.	K2
3.	**Demonstrate** private and consortium block chain systems and Initial Coin Offering.	K2
4.	**Apply** block chain concepts and security to the different applications.	K3
5.	**Develop** block chain programs and chain codes using python and Hyperledger fabric	K3

SYLLABUS

UNIT-I (10Hrs)	**Fundamentals of Blockchain:** Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future. **Blockchain Types and Consensus Mechanism:** Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol. **Cryptocurrency:** Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.
UNIT-II (10 Hrs)	**Public Blockchain System:** Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain. **Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

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UNIT-III (10 Hrs)	**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain. **Consortium Blockchain:** Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda. **Initial Coin Offering:** Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.
UNIT-IV (10 Hrs)	**Security in Blockchain**: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric. **Applications of Blockchain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.
UNIT-V (10 Hrs)	**Blockchain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain. **Blockchain platform using Hyperledger Fabric:** Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK. **Blockchain Case Studies:** Retail, Banking and Financial Services, Healthcare, Energy and Utilities.
Textbooks:	
1.	"Block chain Technology", Chandramouli Subramanian, Asha A.George, Abhilasj K A and Meena Karthikeyan, Universities Press, First Edition, 2020.
Reference Books:	
1.	Blockchain Blue print for Economy, Melanie Swan, SPD Oreilly.
2.	Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gauar, Pearson Addition Wesley.
e-Resources	
1.	https://www.ibm.com/topics/blockchain
2.	https://ethereum.org/en/what-is-ethereum
3.	https://consensys.net/block

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3204	PE	3	--	--	3	30	70	3 Hrs.

SOFTWARE ENGINEERING

(For CIC)

Course Objectives: This course aims to equip students with the following

1.	Software life cycle models, Software requirements and SRS document.
2.	Project Planning, quality control and ensuring good quality software.
3.	Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

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

S.No.	Outcome	Knowledge Level
1.	**Determine** the appropriate software life cycle model for a specific application or problem	K3
2.	**Use** UML modelling for analyzing and specifying the proposed system for a given application/problem	K3
3.	**Apply** software designing principles for designing the proposed system	K3
4.	**Demonstrate** approaches for ensuring software reliability, quality management and testing	K3
5.	**Apply** project management techniques to assess and monitor project progress effectively	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction:** Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering. **Software Life Cycle Models**: Basic concepts, Waterfall model and its extensions, Rapid application development, Spiral model. **Agility:** Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models.
UNIT-II (10 Hrs)	**Requirements Analysis And Specification:** Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification. **Object Modelling using UML**: Basic Object-Orientation Concepts, Unified Modelling Language, UML Diagrams, Use Case Model, Class Diagrams, Interaction Diagrams, Activity Diagrams and State Chart Diagram.

UNIT-III (10 Hrs)	**Software Design:** Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. Approaches to Software design. **Function-Oriented Software Design:** Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design. **User Interface Design:** Characteristics of a good user interface, Basic concepts, user interface design methodology.
UNIT-IV (10 Hrs)	**Coding And Testing:** Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, System testing. **Software Reliability and Quality Management:** Software reliability, Statistical testing, Software quality, Software quality management system, SEI Capability maturity model, and Six Sigma.
UNIT-V (10 Hrs)	**Software Project Management:** Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Configuration Management **Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, and Software maintenance process models and Estimation of maintenance cost.

Text Books:	
1.	Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2.	Software Engineering A practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition.
Reference Books:	
1.	Software Engineering, Ian Sommerville, 10th Edition, Pearson.
2.	Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105182/
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3205	PE	3	--	--	3	30	70	3 Hrs.

MOBILE ADHOC NETWORKS

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
2.	Understand the security requirements and challenges in ad hoc wireless networks and explore secure routing, key management, and intrusion detection techniques to safeguard MANETs.
3.	Evaluate the performance of sensor networks and identify bottlenecks.

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

S.No	Outcome	Knowledge Level
1.	**Explain** the fundamental concepts of Ad Hoc wireless networks and describe the design considerations and classifications of MAC protocols for Ad Hoc Wireless Networks.	K2
2.	**Apply** the design goals and challenges of Routing and Transport layer protocols to configure reliable communication over Ad Hoc Wireless Networks.	K3
3.	**Apply** appropriate security mechanisms to meet network-security requirements and mitigate potential network security threats and attacks in Ad Hoc networks.	K3
4.	**Demonstrate** the use of wireless sensor network principles to address challenges in dynamic WSN environments.	K3
5.	**Use** suitable sensor hardware, operating systems, and programming models to create simulation environments in wireless sensor networks.	K3

SYLLABUS

UNIT-I (8Hrs)	**Introduction to Ad Hoc Wireless Networks:** Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet. **MAC protocols for Ad hoc Wireless Networks**: Issues, Design Goals and Classifications of the MAC Protocols.
UNIT-II (10 Hrs)	**Routing Protocols for Ad Hoc Wireless Networks:** Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches. **Transport layer Protocols for Ad Hoc Wireless Networks:** Issues and

	design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Other Transport layer protocols.
UNIT-III (10 Hrs)	**Security protocols for Ad hoc Wireless Networks-** Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.
UNIT-IV (10 Hrs)	**Basics of Wireless Sensors and Applications:** The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks, Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
UNIT-V (10 Hrs)	**Security in WSNs:** Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, **Dataflow Style Language:** TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.
Text Books:	
1.	Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
2.	Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal*, World Scientific Publications / Cambridge University Press, March 2006
Reference Books:	
1.	Wireless Sensor Networks: An Information Processing Approach, 1st edition, *Feng Zhao, Leonidas Guibas,* Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2.	Wireless Sensor Networks, 1st edition , Ian F. Akyildiz and Mehmet Can Vuran, Wiley Publications, 2010.
3.	Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
4.	Ad hoc Networking, 1stedition,*CharlesE.Perkins*, Pearson Education, 2001
5.	Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng,* Auerbach Publications, Taylor & Francis Group, 2007
6.	Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010
e-Resources:	
1.	https://en.wikipedia.org/wiki/Wireless_ad_hoc_network
2.	https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3206	PE	3	--	--	3	30	70	3 Hrs.

PUBLIC BLOCKCHAIN ETHEREUM

(CIC)

Course Objectives: This course aims to equip students with the following:

1.	Explain the fundamentals of distributed computing and blockchain.
2.	Discuss the concepts in bitcoin.
3.	Demonstrate Ethereum platform.

Course Outcomes: At the end of the Course Student will be able to

S. No	Outcome	Knowledge Level
1.	**Describe** the concepts of distributed computing and its role in blockchain	K2
2.	**Describe** the concepts of cryptography and its role in blockchain	K2
3.	**Identify** the benefits, drawbacks blockchain applications	K3
4.	**Apply** the technologies involved in bitcoin	K3
5.	**Develop** blockchain applications usingethereum platform.	K3

SYLLABUS

UNIT-I (10Hrs)	**Blockchain 101:** Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. **Decentralization:** Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations
UNIT-II (10 Hrs)	**Introduction to Cryptography & Cryptocurrencies:** Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency, How Bitcoin Achieves Decentralization: Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Putting it all together,
UNIT-III (10 Hrs)	**Mechanics of Bitcoin:** Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements How to Store and Use Bitcoins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets

UNIT-IV (10 Hrs)	**Bitcoin Mining:** The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies. **Bitcoin and Anonymity:** Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.
UNIT-V (10 Hrs)	**Smart Contracts and Ethereum 101:** Smart Contracts: Definition, Ricardian contracts. **Ethereum 101:** Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.
Textbooks:	
1.	Mastering Blockchain – Distributed ledgers, decentralization and smart contracts explained, Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017.
2.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark., Bitcoin and Cryptocurrency Technologies: A comprehensive Introduction. Princeton University Press, 2016.
Reference Books:	
1.	Mastering Bitcoins: Unlocking Digital Cryptocurrencies by Andreas Antonopoulos. O'ReillyMedia, Inc, 2013.
e-Resources	
1	https://blockchain.berkeley.edu/courses/
2	https://cbr.stanford.edu/

Estd. 1980
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Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3207	PE	3	0	0	3	30	70	3Hrs.

SECURITY ASSESSMENT AND RISK ANALYSIS

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	The course takes a software development perspective to the challenges of engineering software systems that are secure
2.	The course deals with the question of how to make the requirements for confidentiality, integrity, and availability integral to the software development process.
3.	Secure software requirements gathering to design, development, configuration, deployment, and ongoing maintenance

Course Outcomes: At the end of the Course Student will be able to

S.No.	Outcome	Knowledge Level
1.	**Illustrate** various aspects and principles of software security.	K2
2.	**Apply** security models for implementing at the design level.	K3
3.	**Use** relevant models to Identify the risks associated with s/w engineering.	K3
4.	**Apply** different security algorithms for secure computing and networking.	K3
5.	**Demonstrate** different security frameworks for different types of systems including electronic systems.	K3

SYLLABUS

UNIT-I(8 Hrs)	**Defining computer security**: the principles of secure software, trusted computing base, etc, threat modeling, advanced techniques for mapping security requirements into design specifications. Secure software implementation, deployment and ongoing management.
UNIT-II (10 Hrs)	**Software design** and an introduction to hierarchical design representations. Difference between high-level and detailed design. Handling security with high-level design. General Design Notions. Security concerns designs at multiple levels of abstraction, Design patterns, quality assurance activities and strategies that support early vulnerability detection, Trust models, security Architecture & design reviews.
UNIT-III (12 Hrs)	**Software Assurance Model:** Identify project security risks & selecting risk management strategies, Risk Management Framework, Security Best practices/ Known Security Flaws, Architectural risk analysis, Security Testing & Reliability (Penn testing, Risk-

	Based Security Testing
UNIT-IV (10 Hrs)	**Security in Enterprise Business:** Identification and authentication, Enterprise Information Security, Symmetric and asymmetric cryptography, including public key cryptography, data encryption standard (DES), advanced encryption standard (AES), algorithms for hashes and message digests. Authentication, authentication schemes, access control models, Kerberos protocol, public key infrastructure (PKI), protocols specially designed for e-commerce and web applications, firewalls and VPNs.
UNIT-V (8Hrs)	**Security development frameworks:** Security issues associated with the development and deployment of information systems, including Internet-based e-commerce, e-business, and e-service systems.
Text Books:	
1.	Gregory Allen , Rachel Derr ,"Threat Assessment and Risk Analysis: An Applied Approach", 2015
2.	W. Stallings, "Cryptography and network security: Principles and practice", 5 th Edition, Upper Saddle River, NJ: Prentice Hall., 2011
Reference Books:	
1.	Gary McGraw, "Software Security: Building Security In", Addison-Wesley, 2006
2.	James F. Broder, Eugene Tucker"Risk Analysis and the Security Survey", 4th Edition, Kindle Edition.2011
e-Resources:	
1.	https://cs155.stanford.edu/
2.	https://ocw.mit.edu/courses/6-858-computer-systems-security-fall-2014/

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3209	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MACHINE LEARNING

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Define machine learning and its different types (supervised and unsupervised) and understand their applications.
2.	Understand data representation, feature selection and feature extraction.
3.	Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN), Linear Discriminants.
4	Implement unsupervised learning techniques, such as K-means clustering, Hierarchical Clustering, Fuzzy C-means clustering.

Course Outcomes: At the end of the Course Student will be able to

S. No	Outcome	Knowledge Level
1.	**Apply** different Machine Learning paradigms, project development stages and Feature engineering	K3
2.	**Use** proximity measures, distance-based classification and regression algorithms, model evaluation metrics on given data	K3
3.	**Solve** classification and regression problems using decision tree algorithms and Bayes Classifier	K3
4.	**Apply** linear discriminants to solve classification problems	K3
5.	**Find** clusters in the given dataset using partitional, hierarchical, and fuzzy clustering algorithms	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. **Representation**: Introduction to Representation, Feature selection, Linear Feature Extraction, Eigen Values and Eigen Vectors, PCA.
UNIT-II (10 Hrs)	**Nearest Neighbor-Based Models**: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor

	Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.
UNIT-III (10 Hrs)	**Models Based on Decision Trees**: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. **The Bayes Classifier**: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC).
UNIT-IV (10 Hrs)	**Linear Discriminants for Machine Learning**: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.
UNIT-V (10 Hrs)	**Clustering**: Introduction to Clustering, Partitioning of Data, Matrix Factorization| Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm.
Text Books:	
1.	"Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 1st Edition, 2024.
Reference Books:	
1.	"Machine Learning", Tom M. Mitchell, 1st Edition, McGraw-Hill Publication, 2017.
2.	"Machine Learning in Action", 1st Edition, Peter Harrington, DreamTech, 2012
3.	"Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 2nd Edition, 2021
e-Resources:	
1.	https://onlinecourses.nptel.ac.in/noc24_cs81/preview
2.	https://onlinecourses.nptel.ac.in/noc24_cs51/preview
3.	https://www.coursera.org/specializations/machine-learning-introduction

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3210	PE	3	--	--	3	30	70	3 Hrs.

SOFTWARE PROJECT MANAGEMENT

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2.	To compare and differentiate organization structures and project structures
3.	To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

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

S.No	Outcome	Knowledge Level
1.	**Apply** the process to be followed in the software development life-cycle models	K3
2.	**Apply** the concepts of project management & planning	K3
3.	**Implement** the project plans through managing people, communications and change	K4
4.	**Conduct** activities necessary to successfully complete and close the Software projects	K4
5.	**Implement** communication, modeling, and construction & deployment practices in software development	K4

SYLLABUS

UNIT-I (10Hrs)	**Conventional Software Management**: The waterfall model, conventional software Management performance. **Evolution of Software Economics**: Software Economics, pragmatic software cost estimation. **Improving Software Economics**: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new**: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
UNIT-II (10 Hrs)	**Life cycle phases**: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process**: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT-III (10 Hrs)	**Model based software architectures**: A Management perspective and technical perspective. **Work Flows of the process**: Software process workflows, Iteration workflows. **Checkpoints of the process**: Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning**: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.
UNIT-IV (10 Hrs)	**Project Organizations and Responsibilities**: Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation**: Automation Building blocks, The Project Environment. **Project Control and Process instrumentation**: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
UNIT-V (10 Hrs)	Agile Methodology, Adapting to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

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Text Books:	
1.	Software Project Management, Walker Royce, PEA, 2005
2.	Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
Reference Books:	
1.	Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2.	Software Project Management, Joel Henry, PEA
3.	Software Project Management in practice, Pankaj Jalote, PEA, 2005
4.	Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5.	Project Management in IT, Kathy Schwalbe, Cengage
e-Resources:	
1.	https://open.umn.edu/opentextbooks/textbooks/software-project-management
2.	Project management resources | Atlassian

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CI3211	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DEVOPS

(For CIC)

Pre-requisites: Software Engineering

Course Objectives: This course aims to equip students with the following:

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	OUT COME	Knowledge Level
1.	**Understand** and apply the DevOps lifecycle to streamline software development and delivery processes.	K3
2.	**Use** Git for version control and team collaboration in software projects.	K3
3.	**Develop** and manage automated build and deployment pipelines using Jenkins.	K4
4.	**Deploy** containerized applications using Docker and orchestrate them with Kubernetes.	K4
5.	**Automate** infrastructure setup and application deployment using Ansible.	K5

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)

Text Books:	
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.
e-Resources:	
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_0135389891719249922 6_shared [DevOps CICD]

SRKR ENGINEERING COLLEGE AUTONOMOUS Estd 1980

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3212	PE	3	--	--	3	30	70	3 Hrs.

NATURAL LANGUAGE PROCESSING

(For CIC)

Course Objectives: This course aims to equip students with the following:

1.	Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information
2.	The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches
3.	Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: At the end of the Course Student will be able to

S.No	Outcome	Knowledge Level
1.	**Demonstrate** a given text with basic Language features	K2
2.	**Design** an innovative application using NLP components	K3
3.	**Explain** a rulebased system to tackle morphology/syntax of a language	K2
4.	**Design** a tag set to be used for statistical processing for real-time applications	K3
5.	**Compare** and contrast the use of different statistical approaches for different types of NLP applications	K2

SYLLABUS

UNIT-I (10 Hrs)	**Introduction:** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.
UNIT-II (10 Hrs)	**Word Level Analysis:** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.
UNIT-III (10 Hrs)	**Syntactic Analysis**: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT-IV (10 Hrs)	**Semantics And Pragmatics:**Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods
UNIT-V (10 Hrs)	**Discourse Analysis and Lexical Resources:** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).
Text Books:	
1.	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2ndEdition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.
2.	Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.
Reference Books:	
1.	Language Processing with Java and Ling Pipe Cookbook, 1stEdition, Breck Baldwin, Atlantic Publisher, 2015
2.	Natural Language Processing with Java, 2ndEdition, Richard M Reese, OReilly Media,2015.
3.	Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
4.	Natural Language Processing and Information Retrieval, 3rdEdition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.
e-Resources:	
1.	https://web.stanford.edu/class/cs224n/
2.	https://huggingface.co/learn/nlp-course

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3214	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

CLOUD COMPUTING LAB

(For CIC)

Course Objectives: This course aims to equip students with the following:

1	To introduce the various levels of services offered by cloud.
2	To give practical knowledge about working with virtualization and containers.
3	To introduce the advanced concepts such as serverless computing and cloud simulation.

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

S.No	Outcome	Knowledge Level
1	**Implement** inter-process communication, messaging, and publish/subscribe techniques in distributed systems.	K3
2	**Deploy** and configure virtual machines, containers, and cloud instances using platforms like Virtual Box, Docker, AWS, and OpenStack.	K3
3	**Use** cloud simulation and serverless platforms to deploy and test basic cloud applications and services.	K3

SYLLABUS

1	Lab on web services.
2	Lab on IPC, messaging, publish/subscribe
3	Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows8 or above.
4	Install a C compiler in the virtual machine created using VirtualBox and execute Simple Programs.
5	Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance. In the process, create a security group allowing access to port 80 on the instance. (OR) Do the same with OpenStack
6	Install Google App Engine. Create a hello world app and other simple web applications using python/java.
7	Start a Docker container and set up a web-server (e.g. apache2 or Python based Flask micro web framework) on the instance. Map the host directory as a data volume for the container.
8	Find a procedure to transfer the files from one virtual machine to another virtual machine. Similarly, from one container to another container

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9	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
10	Utilize OpenFaaS – Serverless computing framework and demonstrate basic event driven function invocation
Additional Programs	
1	Install Hadoop single node cluster and run simple applications like word count.
2	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
Reference Books:	
1	Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, McGraw Hill, 2024.
2	Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012
e-Resources:	
1	Online documentation and tutorials from cloud service providers (e.g. AWS, Google App Engine)https://aws.amazon.com/getting-started/
2	Docker, Reference documentation, https://docs.docker.com/reference/
3	OpenFaaS, Serverless Functions Made Simple, https://docs.openfaas.com/

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3215	PC	--	--	3	1.5	30	70	3 Hrs.

BLOCK CHAIN TECHNOLOGY LAB

(For CIC)

Course Objectives: This course aims to equip students with the following:

1	Understanding Block chain Fundamentals and creating basic blocks.
2	Develop Block chain Applications in a structured manner.
3	Create own crypto currency and get familiarity with future currencies.
4	Evaluate and Analyze Block chain Systems.

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

S.No	Outcome	Knowledge Level
1	Apply Knowledge of Block chain Concepts and creating basic blocks.	K3
2	Design and Implement Block chain Applications.	K3
3	Apply the concepts of crypto currency and creating a basic form of it.	K3
4	Evaluate and Analysis of Blockchain Systems.	K5

SYLLABUS

1	Creating Merkle tree
2	Creation of Block
3	Block chain Implementation Programming code.
4	Creating ERC20token
5	Java code to implement block chain in Merkle Trees
6	Java Code to implement Mining using block chain
7	Java Code to implement peer-to-peer using block chain
8	Creating a Crypto-currency Wallet

Reference Books:

1	"Block chain Technology", Chandramouli Subramanian, Asha A.George, Abhilasj K A and Meena Karthikeyan, Universities Press, First Edition, 2020.
2	Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain by Ritesh Modi.
3	Blockchain for Business with Hyperledger Fabric: A complete guide to enterprise Blockchain implementation using Hyperledger Fabric, Nakul Shah, BpB.

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI3216	SEC	-	1	2	2	30	70	3 Hrs.

FULL STACK DEVELOPMENT – 2

(For CIC)

Course Objectives: This course aims to equip students with the following:

1	Make use of router, template engine, and authentication using sessions to develop applications in ExpressJS.
2	Build a single-page application using RESTful APIs in ExpressJS.
3	Apply routers and hooks in designing ReactJS applications.
4	Make use of MongoDB queries to perform CRUD operations on document databases.

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

S.No	Outcome	Knowledge Level
1	**Develop** dynamic and responsive web pages using ReactJS.	K4
2	**Develop** web applications with document database using MongoDB	K4
3	**Build** web applications using RESTful APIs in Express JS	K4

SYLLABUS

1	**Node.js** a. Write a program to show the workflow of JavaScript code executable by creating a web server in Node.js. b. Write a program to transfer data over http protocol using http module. c. Create a text file src.txt and add the following content to it. (HTML, CSS, Javascript, Typescript, MongoDB, Express.js, React.js, Node.js) d. Write a program to parse an URL using URL module. e. Write a program to create a user-defined module and show the workflow of Modularization of application using Node.js
2	**Typescript** a. Write a program to understand simple and special types. b. Write a program to understand function parameter and return types. c. Write a program to show the importance with Arrow function. Use optional, default and REST parameters. d. Write a program to understand the working of Typescript with class, constructor, properties, methods and access specifiers. e. Write a program to understand the working of namespaces and modules. f. Write a program to understand generics with variables, functions and constraints.

3	**Augmented Programs:** (Any 2 must be completed) a. Write a CSS program, to apply 2D and 3D transformations in a web page. b. Design a web page with new features of HTML5 and CSS3. c. Design a to-do list application using JavaScript.
4.	**ExpressJS – Routing, HTTP Methods, Middleware.** a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building. b. Write a program to accept data, retrieve data and delete a specified resource using http methods. c. Write a program to show the working of middleware.
5	**ExpressJS – Templating, Form Data** a. Write a program using templating engine. b. Write a program to work with form data.
6	**ExpressJS – Cookies, Sessions, Authentication** a. Write a program for session management using cookies and sessions. b. Write a program for user authentication.
7	**ExpressJS – Database, RESTful APIs** a. Write a program to connect MongoDB database using Mongoose and perform CRUD operations. b. Write a program to develop a single page application using RESTful APIs.
8	**ReactJS – Render HTML, JSX, Components – function & Class** a. Write a program to render HTML to a web page. b. Write a program for writing markup with JSX. c. Write a program for creating and nesting components (function and class).
9	**ReactJS – Props and States, Styles, Respond to Events** a. Write a program to work with props and states. b. Write a program to add styles (CSS & Sass Styling) and display data. c. Write a program for responding to events.
10	**ReactJS – Conditional Rendering, Rendering Lists, React Forms** a. Write a program for conditional rendering. b. Write a program for rendering lists. c. Write a program for working with different form fields using react forms.
11	**ReactJS – React Router, Updating the Screen** a. Write a program for routing to different pages using react router. b. Write a program for updating the screen.
12	**ReactJS – Hooks, Sharing data between Components** a. Write a program to understand the importance of using hooks. b. Write a program for sharing data between components.
13	**ReactJS Applications – To-do list and Quiz** Design a to-do list application.

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14	**MongoDB – Installation, Configuration, CRUD operations** a. Install MongoDB and configure ATLAS b. Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
15	**MongoDB – Databases, Collections and Records** a. Write MongoDB queries to Create and drop databases and collections. b. Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
16	**Augmented Programs: (Any 2 must be completed)** a. Design a to-do list application using NodeJS and ExpressJS. b. Design a Quiz app using ReactJS. c. Complete the MongoDB certification from MongoDB University website.
Reference Books:	
1.	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
2.	Node.Js in Action, Mike Cantelon, Mark Harter, T.J. Holowaychuk, Nathan Rajlich,Manning Publications. (Chapters 1-11)
3.	React Quickly, AzatMardan,ManningPublications(Chapters 1-8,12-14)
e-Resources:	
1.	ExpressJS - https://www.tutorialspoint.com/expressjs
2.	ReactJS - https://www.w3schools.com/REACTand https://react.dev/learn#
3.	MongoDB - https://learn.mongodb.com/learning-paths/introduction-to-mongodb

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23MC3201	MC	2	--	--		30	--	

EMPLOYABILITY SKILLS

(For AIDS, CIC, CSIT, CSD, ECE and EEE)

Course Objectives:

1.	To introduce concepts required in framing grammatically correct sentences and identifying errors while using standard English.
2.	To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse.
3.	To inculcate logical thinking in order to frame and use data as per the requirement.

Course Outcomes

S.No	Outcome	Knowledge Level
1	Match various vocabulary items that appear in competitive examinations with their contextual meanings accurately.	K1
2.	Identify grammatical and ungrammatical usage of English language in all the grammar related questions asked in various competitive examinations like CAT, GRE, IBPS.	K3
3.	Infer meaning from complex texts that are set as questions in different competitive examinations held for higher education or employment	K2
4.	Find solutions to complex arithmetic problems set as questions in the competitive examinations held for employment or higher education	K1
5.	Apply logical thinking abilities in solving the problems of reasoning that appear in the examinations like CAT, GRE, GATE, IBPS.	K3

SYLLABUS

UNIT-I (10Hrs)	Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations. Spotting Errors, Sentence Improvement
UNIT-II (10 Hrs)	Time and work, Pipes and Cisterns. Time and Distance Problems, Problems on boats and streams. Percentages, Profit and loss, Simple interest and Compound interest. Discount Problems.
UNIT-III (10 Hrs)	Analogies, Odd One Out. (Verbal ability) Number Series, Letter Series, Analogy, Alpha Numeric Series, Order and Ranking, Directions, Data sufficiency, Syllogisms.

UNIT-IV (10 Hrs)	Sentence Completion, Sentence Equivalence, Close Test Reading Comprehension , Para Jumbles
UNIT-V (10 Hrs)	Number System: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF.
Textbooks:	
1.	*How to Prepare for Verbal Ability and Reading Comprehension for CAT* (10th edition) by Arun Sharma and Meenakshi Upadhyay, McGraw Hill Education, 2022.
2.	How to Prepare for Quantitative Aptitude for CAT (10th edition) by by Arun Sharma , McGraw Hill Education, 2022.
Reference Books:	
1.	*English Collocation in Use*- Intermediate (2nd edition) by Michael McCarthy& Felicity O'Dell, CUP, 2017.
2.	*Magical Book On Quicker Maths* (5th Edition) By M.Tyra, BSC Publishing Co Pvt. Ltd, 2018.
e-Resources	
1.	www.Indiabix.com
2.	www.800score.com

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