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	

CSE (INTERNET OF THINGS & CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY) (Minors)

(Applicable for CE, ECE, EEE & ME)

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

Course Code	Course Name	Year/ Sem	Cr	L	T	P	C.I.E	S.E.E	Total Marks
B23CIM101	Computer Networks	II-II	3	3	0	0	30	70	100
B23CIM201	Introduction to IoT	III-I	3	3	0	0	30	70	100
B23CIM301	Cyber Security	III-II	3	3	0	0	30	70	100
B23CIM401	Cloud Computing	IV-I	3	3	0	0	30	70	100
B23CIM501	*MOOCS-I	II-II to IV-I	3	--	--	--	--	--	100
B23CIM601	*MOOCS-II	II-II to IV-I	3	--	--	--	--	--	100
		TOTAL	**18**	**12**	**0**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any CSE (INTERNET OF THINGS & CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY) related Program Core Courses from NPTEL/SWAYAM with a minimum duration of12 weeks (3 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year I Semester.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CIM101	**Minors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

COMPUTER NETWORKS

(Minor Degree course in CIC)

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

1.	To understanding the principles of computer networks.
2.	To familiarize with Reference model OSI and TCP/IP
3.	To explore Datalink, Transport and Network layer protocols
4.	To study application layer applications

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

S. No	Outcome	Knowledge Level
1.	**Illustrate** the OSI reference model, TCP/IP, and Digital transmission techniques	K2
2.	**Apply** error detection and correction, flow control with respect to data link layer	K3
3.	**Summarize** MAC layer protocols and LAN technologies	K2
4.	**Demonstrate** various network layer services and Routing algorithms	K3
5.	**Explain** Transport layer and application layer protocols	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Types of Computer Networks, Network Topologies Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models. **Physical Layer**: Introduction to physical layer, Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media
UNIT-II (10 Hrs)	**The Data Link Layer:** Data Link Layer Design Issues, Services Provided To the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC. Multiple Access Protocols in Wired Lans, Ethernet, Fast Ethernet, Gigabit Ethernet
UNIT-III (10 Hrs)	**The Network Layer**: Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, The IP Version 4 Protocol, IP Addresses- Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6
UNIT-IV (10 Hrs)	**The Transport Layer:** The Transport Layer Services, Connection Establishment and Termination, Congestion Control, Sliding Window Protocol, Transport Layer Protocols: UDP, TCP and SCTP

UNIT-V (10 Hrs)	**The Application Layer: S**ervices And Protocols, The World Wide Web, HTTP, Domain Name Space, Remote Loging, Electronic Mail and File Transfer

Text Books:	
1.	"Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5th Edition, Pearson
2.	"Data Communications and Networking", Behrouz A Forouzan, 4th Edition, Tata McGraw Hill Education
Reference Books:	
1.	"Data and Computer Communication", William Stallings, Pearson
2.	"TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill.
e-Resources:	
1.	https://nptel.ac.in/courses/106105183/25
2.	http://www.nptelvideos.in/2012/11/computer-networks.html
3	https://www.youtube.com/playlist?list=PLBlnK6fEyqRiw-GZRqfnlVIBz9dxrqHJS

				Course Code: B23CIM101	
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		II B.Tech. II Semester MODEL QUESTION PAPER			
		COMPUTER NETWORKS			
		(Minor Degree course in CIC)			
Time: 3 Hrs.				**Max. Marks: 70 M**	
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
				10 x 2 = 20 Marks	
			CO	**KL**	**M**
1.	**a).**	List any two network topologies	1	2	1
	b).	Define a Local-Area Network	1	2	1
	c).	State the minimum Ethernet frame size (in bytes	2	2	1
	d).	What is bit stuffing?	2	2	1
	e).	Expand ICMP and ARP	3	2	1
	f).	What is the default subnet mask of a Class A network?	3	2	1
	g).	Which transport-layer protocol provides flow control?	4	2	1
	h).	Name any one field in a UDP header	4	2	1
	i).	State the default port number of HTTPS	5	2	1
	j).	Mention any two e-mail retrieval protocols	5	2	1
				5 x 10 = 50 Marks	
		UNIT-1			
2.		Compare guided and unguided transmission media with neat sketches and examples.	1	3	10
		OR			
3.	**a).**	Define and differentiate LAN, MAN, WAN.	1	2	5
	b).	Explain star, bus, ring topologies with their advantages and disadvantages.	1	3	5
		UNIT-2			
4.	**a).**	Distinguish between Go-back-N and Selective-Repeat ARQ protocols.	2	3	5
	b).	A 12-bit dataword 110100110011 is to be sent using CRC generator polynomial $G(x)=x^4+x+1$. Find the transmitted frame.	2	3	5
		OR			
5.	**a).**	Explain p-persistent CSMA and its performance.	2	3	5
	b).	An 11-bit Hamming code 10111011010 is received. Detect and correct the error (if any) and retrieve the original 7-bit data.	2	3	5
		UNIT-3			
6.	**a).**	A Class C network 192.168.1.0 must be split into 6 sub-nets. (i) Find the new subnet mask (dotted & CIDR). (ii) Hosts per subnet. (iii) First & last valid host of subnet 3.	3	3	5
	b).	Describe the leaky-bucket and token-bucket congestion control algorithms.	3	2	5
		OR			

7.		Explain the differences between distance-vector and link-state routing, detailing their update mechanisms.	3	3	10
		UNIT-4			
8.	**a).**	Draw the TCP segment format and explain each field.	4	3	5
	b).	Discuss slow-start and congestion-avoidance phases in TCP with a congestion window diagram.	4	3	5
		OR			
9.	**a).**	Compare features of SCTP with TCP.	4	3	5
	b).	Demonstrate connection termination in TCP using a timing diagram.	4	2	5
		UNIT-5			
10.	**a).**	Explain SMTP in detail. Give its uses, state strengths and weakneses	5	2	5
	b).	Differentiate persistent and non-persistent HTTP connections with timing diagrams.	5	2	5
		OR			
11.	**a).**	Explain in detail about DNS and its frame format.	5	2	5
	b).	Explain FTP architecture highlighting control & data connections.	5	2	5

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CIM201	**Minors**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

INTRODUCTION TO IoT

(Minor Degree Course in CIC)

Pre-requisites: Computer Networks

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

1.	Understand the fundamental concepts and real-world applications of IoT.
2.	Learn about IoT architecture covering edge, cloud, and application layers.
3.	Gain hands-on skills to build an end-to-end IoT application.
4.	Explore IoT communication protocols, data handling, and sensors.
5.	Research and present advanced topics in IoT through seminars.

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

S. No	Outcome	Knowledge Level
1.	**Understand** the fundamental concepts of IoT, differentiate between Consumer and Industrial IoT, and identify use cases in various industry domains.	K2
2.	**Understand** IoT architecture including edge, cloud, and application layers, and describe data processing pipelines and edge computing concepts.	K2
3.	**Apply** the knowledge of sensors, transducers, and industrial systems to integrate sensors with processing boards and collect industrial data.	K3
4.	**Apply** communication protocols and networking techniques to enable data transmission between IoT devices and cloud applications.	K3
5.	**Apply** data processing methods for time-series IoT data and present research findings on IoT-related topics through seminars.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Internet of Things and Use Cases:** Basic concepts of IoT, Differences: Consumer IoT vs Industrial IoT, Fundamental building blocks of IoT, Industry-wise IoT applications: Healthcare, Smart Homes.
UNIT-II (10 Hrs)	**IoT Architecture & Edge Computing:** IoT reference models and Industrial Internet Reference Architecture (IIRA), Role of Edge Computing in IoT, IoT Gateways and their functions, data stream processing.
UNIT-III (08 Hrs)	**Sensors and Industrial Systems:** Introduction to sensors and transducers, Sensor integration with microcontrollers, Introduction to data acquisition systems, Industrial control systems and use cases
UNIT-IV (8 Hrs)	**IoT Networking & Communication:** Mapping OSI model to IoT architecture, Proximity networking: ZigBee, Bluetooth, and Serial Communication, Industrial protocols: Modbus,

	CANbus, Communication with cloud: REST APIs, MQTT, TCP/UDP, and Web Sockets.
UNIT-V (8 Hrs)	**IoT Data Processing & Seminar Topics:** Time-series data: characteristics, examples, Time-series databases and analytics, Summarization, sketching, anomaly detection, Handling missing/noisy data. **Seminar Component (Research & Presentation):** Students (in teams) will choose a topic, conduct a literature survey, and present findings. **Suggested Seminar Topics:** IoT Data Visualization, Smart Cities / Smart Grids / Smart Homes / Connected Vehicles, Cloud-based IoT platforms, Low Power Wide Area Networks (LPWAN), IoT Device Management, Embedded OS for IoT, IoT Security (risks, secure communication, privacy).

Text Books:	
1.	Samuel Greengard, The Internet of Things, MIT Press Essential Knowledge Series.
2.	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things - David Hanes, Gonzalo Salgueiro, Patrick Grossetete Robert Barton, Jerome Henry. 24750 Copyright© 2017 Cisco Systems, Inc. Published by: Cisco Press 800 East 96th Street.
3.	Internet of Things: Architecture and Design Principles by Raj Kamal, McGraw Hill Education priva limited, 2017.
Reference Books:	
1.	Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm
2.	World Economic Forum Report on Industrial Internet of Things - https://www.weforum.org/reports/industrial-internet-things
3.	50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/
4.	Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
e-Resources:	
1.	https://onlinecourses.nptel.ac.in/noc21_cs46
2.	https://www.coursera.org/learn/iot

				Course Code: B23CIM201	
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R23**
III B.Tech. I Semester MODEL QUESTION PAPER					
INTRODUCTION TO IoT					
(Minor Degree Course in CIC)					
Time: 3 Hrs.				**Max. Marks: 70 M**	
Answer Question No.1 compulsorily					
Answer **ONE Question** from **EACH UNIT**					
Assume suitable data if necessary					
				10 x 2 = 20 Marks	
			CO	**KL**	**M**
1.	**a).**	What is the key difference between Consumer IoT and Industrial IoT?	1	2	2
	b).	List any two fundamental building blocks of an IoT system.	1	2	2
	c).	Mention one use case of IoT in healthcare and one in smart homes.	1	2	2
	d).	What is the role of an IoT Gateway in an IoT architecture?	2	2	2
	e).	Define Edge Computing and mention one of its advantages in IoT.	2	2	2
	f).	Differentiate between a sensor and a transducer.	3	3	2
	g).	What is the purpose of a Data Acquisition System (DAQ) in industrial IoT?	3	3	2
	h).	Name any two industrial communication protocols used in IoT.	4	3	2
	i).	What is the function of MQTT in IoT communication?	4	3	2
	j).	Mention any two characteristics of time-series data.	5	3	2
				5 x 10 = 50 Marks	
		UNIT-1			
2.	**a).**	Explain the core concept of the Internet of Things with suitable real-world examples.	1	2	5
	b).	Analyze the components of a smart home system and explain how they interact to provide automation.	1	3	5
		OR			
3.	**a).**	Illustrate how IoT can improve patient monitoring and emergency response in the healthcare sector.	1	3	5
	b).	Compare and contrast the design goals of Consumer IoT and Industrial IoT with relevant scenarios.	1	2	5
		UNIT-2			
4.	**a).**	Describe the Industrial Internet Reference Architecture (IIRA) and its key functional layers	2	2	5
	b).	Illustrate the flow of data through an IoT system that includes edge, gateway, and cloud components.	2	3	5

		OR			
5.	**a).**	Explain how Edge Computing enhances real-time data processing in IoT applications.	2	2	5
	b).	Analyze a scenario where stream processing is required in IoT and explain how it is implemented.	2	3	5
		UNIT-3			
6.	**a).**	Explain the working principle of a temperature sensor and its integration with microcontrollers.	3	2	5
	b).	Demonstrate how sensors and actuators are used together in an industrial automation system.	3	3	5
		OR			
7.	**a).**	Describe the architecture and components of a typical data acquisition system used in industry.	3	2	5
	b).	Analyze a real-world industrial process and describe how IoT sensors help monitor and control it.	3	3	5
		UNIT-4			
8.	**a).**	Map the OSI model layers to components in a typical IoT communication architecture.	4	2	5
	b).	Compare Modbus and CAN bus protocols in terms of usage, features, and message structure.	4	3	5
		OR			
9.	**a).**	Explain the role and functioning of ZigBee and Bluetooth in proximity communication.	4	2	5
	b).	Design a basic communication flow using MQTT for sending sensor data to a cloud platform.	4	3	5
		UNIT-5			
10.	**a).**	Explain how time-series databases differ from traditional databases, with suitable examples.	5	2	5
	b).	Demonstrate how to summarize time-series data from a smart meter using a simple method.	5	3	5
		OR			
11.	**a).**	Describe the importance of anomaly detection in IoT data and how it helps in system reliability.	5	2	5
	b).	Conduct a short literature review on any one topic from the seminar list (e.g., LPWAN, IoT security) and present key findings.	5	3	5

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CIM301	Minors	3	--	--	3	30	70	3 Hrs.

CYBER SECURITY

(Minor Degree Course in CIC)

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

1.	Identify security risks and take preventive steps
2.	Understand the forensics fundamentals
3.	Understand the evidence capturing process

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

S. No	Outcome	Knowledge Level
1.	**Analyze** Cybercrimes and their classifications	K3
2.	**Apply** different tools and methods	K2
3.	**Analyze** different methods of investigations of cybercrime	K3
4.	**Summarize** Computer Forensics and investigations	K2
5.	**Summarize** different Cyber Crime Legal Perspectives	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cyber criminals, Classifications of Cybercrime, Cyber stalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT-II (10 Hrs)	**Tools and Methods:** Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.
UNIT-III (10 Hrs)	**Cyber Crime Investigation:** Introduction, Investigation Tools, e Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-MailRecovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT-IV (10 Hrs)	**Computer Forensics and Investigations:** Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT-V (10 Hrs)	**Cyber Crime Legal Perspectives:** Introduction, Cybercrime and the Legal Landscape around the World, The Indian ITAct, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital signatures and the Indian ITAct, Amendments to the Indian ITAct, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.
Text Books:	
1.	SunitBelapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2.	Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
Reference Books:	
1.	Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3.	Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.
e-Resources:	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

				Course Code: B23CIM301	
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R23**
III B.Tech. II Semester MODEL QUESTION PAPER					
CYBER SECURITY					
(Minor Degree Course in CIC)					
Time: 3 Hrs.					**Max. Marks: 70 M**
Answer Question No.1 compulsorily					
Answer **ONE Question** from **EACH UNIT**					
Assume suitable data if necessary					
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	What is cybercrime?	1	1	2
	b).	Who are cybercriminals and what motivates their actions?	1	1	2
	c).	Define phishing and explain how it is commonly carried out.	2	2	2
	d).	What is steganography and how is it used in cybercrime?	2	2	2
	e).	What is IP tracking and how is it useful in tracing cybercriminals?	3	2	2
	f).	Differentiate encryption and decryption	3	2	2
	g).	What is computer forensics	4	1	2
	h).	Explain audio and video analysis aids	4	2	2
	i).	Define digital signatures	5	1	2
	j).	What are the consequences of not addressing the weaknesses in the IT Act?	5	2	2
					5 x 10 =50Marks
		UNIT-1			
2.	**a).**	Explain the relationship between cybercrime and information security.	1	2	5
	b).	Explain the common types of attacks on mobile/cell phones	1	2	5
		OR			
3.	**a).**	Describe the different classifications of cybercrime with suitable examples for each.	1	2	5
	b).	Discuss the role of cybercafés in cybercrime.	1	2	5
		UNIT-2			
4.	**a).**	Differentiate DoS and DDoS attacks?	2	2	5
	b).	Describe different password cracking techniques and explain how cybercriminals exploit them.	2	2	5
		OR			
5.	**a).**	Explain the working and impact of keyloggers and spyware.	2	2	5
	b).	What are Trojan horses and backdoors? How do they differ from	2	2	5

		viruses and worms?			
		UNIT-3			
6.	**a).**	Explain the major tools used in cybercrime investigation	3	2	5
	b).	Discuss the process of digital evidence collection and preservation.	3	2	5
		OR			
7.	**a).**	Describe the steps involved in investigating an email-related cybercrime	3	2	5
	b).	Explain how password cracking is performed during an investigation	3	2	5
		UNIT-4			
8.	**a).**	Explain two commonly used computer forensics software tools and their main functions.	4	2	5
	b).	Briefly explain how fingerprint or face recognition is used in digital forensics.	4	2	5
		OR			
9.	**a).**	Describe the steps involved in preparing for a computer investigation.	4	2	5
	b).	Explain about Windows System Forensics	4	2	5
		UNIT-5			
10.	**a).**	Explain the main purpose of the Indian Information Technology (IT) Act?	5	2	5
	b).	How does cybercrime affect students in India?	5	2	5
		OR			
11.	**a).**	Analyze the current cybercrime scenario in India	5	2	5
	b).	Discuss the role of cyberlaw in defining punishment for cybercriminals. Provide examples of punishable offenses under Indian law.	5	2	5

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CIM401	Minors	3	--	--	3	30	70	3 Hrs.

CLOUD COMPUTING

(Minor Degree Course in CIC)

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

1.	To explain the evolving utility computing model called cloud computing.
2.	To introduce the various levels of services offered by cloud.
3.	To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
4	To emphasize the security and other challenges in cloud computing.
5	To introduce advanced concepts such as containers and serverless computing in modern cloud environments.

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

S. No	Outcome	Knowledge Level
1.	**Apply** the fundamental concepts of cloud computing to identify appropriate service and deployment models and assess the benefits of major cloud platforms.	K3
2.	**Describe** and apply enabling technologies such as parallel and distributed computing, and remote procedure calls (RPC) in the context of cloud infrastructure.	K3
3.	**Analyze** various virtualization and containerization technologies, and their roles in enabling cloud platforms and services.	K4
4.	**Analyze** key challenges in cloud computing such as interoperability, scalability, energy efficiency, and cloud security models.	K4
5.	**Explain** and evaluate serverless computing concepts, including Function-as-a-Service (FaaS), and assess the capabilities of public and open-source serverless platforms.	K4

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).
UNIT-III (10 Hrs)	**Virtualization and Containers:** Characteristics of virtualized environments, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration.
UNIT-IV (10 Hrs)	**Cloud computing challenges:** Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, cloud computing security, fundamentals of computer security, cloud security architecture, security in cloud deployment models.
UNIT-V (08 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.

Text Books:	
1.	Mastering Cloud Computing, 2nd edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, McGraw 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.	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly Media
5.	Cloud Computing: A Hands-On Approach, ArshdeepBahga& Vijay Madisetti, Universities Press
e-Resources	
1.	https://nptel.ac.in/courses/106105167

					Course Code: B23CIM401
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		IV B.Tech. I Semester MODEL QUESTION PAPER			
		CLOUD COMPUTING			
		(Minor Degree Course in CIC)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	What is cloud computing?	1	1	2
	b).	List any two characteristics of cloud computing.	1	1	2
	c).	What is meant by ubiquitous internet?	2	1	2
	d).	Define parallel computing.	2	1	2
	e).	What is virtualization?	3	1	2
	f).	Name any two virtualization technologies.	3	1	2
	g).	Define cloud interoperability.	4	1	2
	h).	What is meant by confidentiality in computer security?	4	1	2
	i).	What is serverless computing?	5	1	2
	j).	What is AWS Lambda?	5	1	2
					5 x 10 = 50 Marks
		UNIT-1			
2.		Explain the types of cloud service models with suitable example for each.	1	2	10
		OR			
3.		Explain the cloud computing reference model in detail, describing each abstraction layer and its function.	1	2	10
		UNIT-2			
4.		Describe Flynn's classification of hardware architectures (SISD, SIMD, MISD, MIMD) with diagrams and examples.	2	2	10
		OR			
5.	**a)**	What is Remote Procedure Call (RPC)? Explain its working and role in distributed cloud systems.	2	2	5
	b)	Compare and contrast parallel and distributed computing. How are both used in cloud infrastructure?	2	2	5
		UNIT-3			
6.	**a).**	What are the pros and cons of virtualization? Provide suitable examples.	3	2	5
	b).	Explain the building blocks of containers. How do they differ from traditional virtual machines?	3	2	5
		OR			
7.		Describe the container platforms LXC and Docker. What are their roles in containerization?	3	2	10

		UNIT-4			
8.	**a).**	What are the key standards used in cloud computing to ensure interoperability and compliance?	4	2	5
	b).	How is security implemented differently in public, private, and hybrid cloud deployment models?	4	2	5
		OR			
9.		Describe the architecture of cloud security. What are its main layers and functions?	4	2	10
		UNIT-5			
10.		Describe the architecture of serverless computing. What are its main components and how do they interact?	5	2	10
		OR			
11.	**a).**	Describe the architecture of Function-as-a-Service (FaaS) with examples such as AWS Lambda and OpenFaaS.	5	2	5
	b).	Discuss the benefits and limitations of serverless computing for developers and businesses.	5	2	5

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks