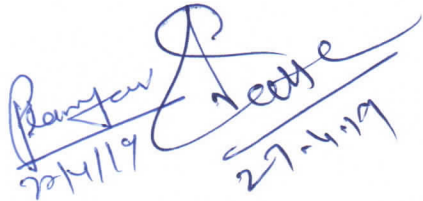
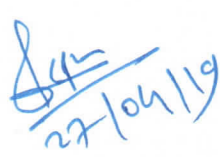
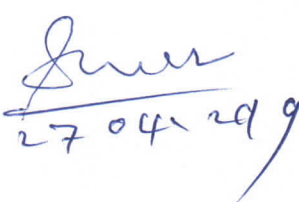
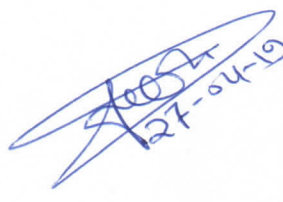
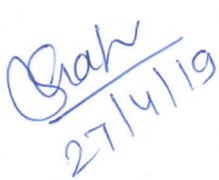



SCHEME OF TEACHING AND EXAMINATIONS 2019-2020
MASTER OF SCIENCE IN COMPUTER SCIENCE
FOURTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Theory	Sessional	Pr	Total	Sessional Marks of Project Work	Project Viva-Voce	Pr	Total
Paper I	Cloud Computing	3	2	-	4	100	50	-	150	40	30	-	70
Paper II	Network Security and Cryptography	3	2	-	4	100	50	-	150	40	30	-	70
Paper III	Internet of Things	3	2	-	4	100	50	-	150	40	30	-	70
Paper IV	Project Based Seminar	-	-	1x2	1	-	50	-	50	-	30	-	30
Paper V	Major Project	-	-	5x2	5	-	100	200	300	-	60	100	160
TOTAL					18	300	300	200	800	120	180	100	400

Note:

- Major Project may be a Research Project also.
- Participating in Workshops, Conferences and Seminars or publishing Research Papers will be given weightage in the research project.

 27/4/19
 27/04/19
 27/04/19
 27-04-19
 27/4/19


FOURTH SEMESTER : M.Sc.(CS)

Paper I : Cloud Computing

Max Marks : 100

Min Marks : 40

Unit – I

Introduction: Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and Challenges, Historical Developments, Cloud Computing Environments, Cloud Platforms and Technologies; The Evolution of Cloud Computing: Parallel Computing vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Introduction of Grid Computing.

Unit – II

Virtualization: Introduction, Characteristics, Taxonomy of Virtualization, Levels of Virtualization, Structure and Mechanism of Virtualization, Virtualization and Cloud Computing, Advantages and Disadvantages, Virtualization Technology Examples: Xen, VMware, Microsoft Hyper-V.

Unit – III

Cloud Computing Architecture: Service Oriented Architecture, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS). Types of Clouds; Economics of the Cloud and Open Challenges; **Security and Organizational aspects:** Host Security and Data Security.

Unit – IV

Migration to the Cloud: Adoption and use of Cloud by Businesses (Small and Enterprise), Pace of Adoption, Benefits and Phases of Adoption, Cloud Service Provider's Capabilities and Liabilities, Success factors and Issues. **Migrating Applications:** Key Aspects, Migration Techniques, Phases of Migration. **Service Level Agreement (SLA):** Aspects and Requirements, Availability and Outages, Credit Calculations, SLA Samples.

Unit – V

Industry Platforms: Amazon Web Services, Google AppEngine, Microsoft Azure; **Cloud Applications:** Scientific Applications, Business and Consumer Applications; Advanced Topics: Energy Efficiency in Clouds, Market Based Management, Federated Clouds / InterCloud, Third Party Cloud Services.

RECOMMENDED BOOKS:

1. **Mastering Cloud Computing**, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education
2. **Cloud Computing: Black Book**, Kailash Jayaswal et al., Kogent Learning Solutions, Dreamtech Press
3. **Cloud Computing: Principles and Paradigms**, Rajkumar Buyya et al., Wiley India
4. **Cloud Computing: Concepts, Technology & Architecture**, Erl, Pearson Education India
5. **Cloud Computing Bible**, Barrie Sosinsky, O'Reilly Media
6. **Cloud Computing: A Practical Approach**, Toby Velte, Anthony Vote and Robert Elsenpeter, McGraw Hill
7. **Cloud Application Architectures: Building Applications and Infrastructures in the Cloud**, George Reese, O'Reilly Media.
8. **Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance**, Tim Matherm Subra Kumaraswamy and Shahed Latif, O'Reilly Media.

Signature
27/4/19
27-4-19
Signature

Signature
27/04/19

Signature
27-04-2019

Signature
27-04-19

FOURTH SEMESTER : M.Sc.(CS)
Paper II : Network Security and Cryptography

Max Marks : 100

Min Marks : 40

UNIT – I: INTRODUCTION

Computer Security Concepts, The Challenges of Computer Security, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A model for network Security, **Symmetric Encryption Principal** : Cryptography, Crypt analysis, Feistel Cipher Structure, DES, Random and Pseudorandom Numbers, Symmetric Block Modes of Operation (ECB, CBC, CFB, CTR).

UNIT – II PUBLIC KEY CRYPTOGRAPHY

Approaches to Message Authentication, **Hash Functions**: Hash Functions Requirement, Security of Hash Functions, The SHA Secure Hash Function, **Public Key Cryptography**: Public –Key Encryption Structure, Applications for Public Key Cryptosystem, RSA, Attacks on RSA, OAEP.

UNIT – III MESSAGE INTEGRITY AND MESSAGE AUTHENTICATION

Message Integrity: Document and Finger Printing, Message and Message Digest, Cryptographic Hash Function Criteria Random Oracle Model, Birthday Problems and Summary of solutions, **Message Authentication**: Modification Detection Code, Message Authentication Code, Introduction of HMAC & CMAC, **Digital Signature**: Comparison, Process, Services, Attacks on Digital Signature.

UNIT – IV MALICIOUS SOFTWARE

Intruders: Intruder Behavior Patterns, Intrusion Techniques, Intrusion Detection by Audit Records, Statistical Intrusion Detection, Distributed Intrusion Detection, Honeypots. Types of Malicious Software, Nature of Viruses, Virus Classification, Antivirus Approaches, Worms and its Propagation model, DDoS Attack.

UNIT – V FIREWALL & SECURITY TOOLS

Firewall: Need & Characteristics of Firewall, Types of Firewall, Firewall Basing, Firewall Location and Configuration, Introduction to Kali Linux ,Tools Available in Kali Linux and Its Usage. Wireshark Packet Analyzer and Its Features. Cyber Security Policy, Domain of Cyber Security Policies.

RECOMMENDED BOOKS:

1. **Network Security Essentials**, William Stallings, PEARSON
2. **Cryptography and Network Security**, William Stallings, PHI.
3. **Cryptography and Network Security**, Atul Kahate, Tata McGraw Hill
4. **Cryptography and Network Security**, B.A. FOROUZAN, TMH
5. **Cyber Security policy Guidebook**, Jennifer Jason Paul, Marcus Jeffery Joseph. Wiley Publication, 2012.
6. **Network Security: The Complete Reference**, Robertra Bragg, Tata McGraw Hill.
7. **Cyber Security Essentials**, James Graham, Richard Ryan, CRC press

[Signature]
27.4.19

[Signature]
27/04/19

[Signature]
27.04.2019

[Signature]
27-04-19

[Signature]
27/4/19

[Signature]
27/4/19

[Signature]

FOURTH SEMESTER : M.Sc.(CS)

Paper III : Internet of Things

Max Marks : 100

Min Marks : 40

Unit – I: OVERVIEW

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit – II: REFERENCE ARCHITECTURE

IoT Architecture – State of the Art – Introduction, State of the art, Reference Model and architecture, **IoT reference Model** – IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints** – Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Unit – III: IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Unit – IV TRANSPORT & SESSION LAYER PROTOCOLS:

Transport Layer : Transmission Control Protocol (TCP), Multipath Transmission Control Protocol (MPTCP), User Datagram Protocol (UDP), Datagram Congestion Control Protocol (DCCP) , Stream Control Transmission Protocol (SCTP), Transport Layer Security (TLS), Datagram Transport Layer Security (DTLS))

Session Layer : Hyper Text Transfer Protocol (HTTP), Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP), Message Queue Telemetry Transport (MQTT)

Unit – V SERVICE LAYER PROTOCOLS & SECURITY:

Service Layer – oneM2M, European Telecommunications Standards Institute (ETSI) M2M (Machine-to-Machine), OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, Routing Protocol for Low-Power and Lossy Networks (RPL), Application Layer

RECOMMENDED BOOKS:

1. **From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, Academic Press, 2014
2. **Learning Internet of Things**, Peter Waher, PACKT publishing
3. **Architecting the Internet of Things**, Bernd Scholz-Reiter, Florian Michahelles, Springer
4. **Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications**, Daniel Minoli, Willy Publications
5. **Internet of Things (A Hands-onApproach)**, Vijay Madisetti and ArshdeepBahga, VPT, 2014.

P. Senthil
27.4.19

S. Srinivas
27/04/19

S. Srinivas
27.04.2019

S. Srinivas
27-04-19

G. Raghav
27/4/19

S. Srinivas