Pre PhD Course
Software Engineering & Cloud Computing
CS-701

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Software Engineering:

Topic	# hours
Introduction to Software Engineering: Definitions, Opportunities & Challenges	**1**
Software Engineering Research Objectives	**1**
Software Productivity, Software Metrics, Software Process, Software Benchmarks	**1**
Overview of Software Requirements Engineering & Research Possibilities	**2**
Overview of Software Quality Management & Research Possibilities	**2**
Overview of Traditional SDLC-Methodologies & Research Possibilities	**2**
Overview of Agile SDLC-Methodologies & Research Possibilities	**2**
Review of Current Trends and Research Directions in Software Engineering (*including presentation from Research Scholars*) – after review of papers from reputed journals (*IEEE Transactions on Software Engineering, IEEE Software, IEEE Computer etc.*)	**4**
Assessment	**2**

Cloud Computing:

Topic	# hours
Introduction to Cloud Computing (CC): Definitions, Components of a Computing Cloud, Differentiating Types of Cloud: Public, Private & Hybrid clouds	**2**
Delivering Services from Cloud: Categorizing Service Types, Comparing Vendor Cloud Products: Amazon, Google, Microsoft and others	**2**
Barriers to Cloud Computing: Handling sensitive data, Aspects of cloud security, Assessing governance solutions	**1**
Cloud Computing Reference Architecture(s): Oracle, NIST, IBM's Open Cloud Architecture, Openstack (www.openstack.org)	**3**
Overview of SaaS and Case-Studies	**2**
Overview of PaaS and Case-Studies	**2**
Overview of IaaS and Case-Studies	**2**
Review of Current Trends and Research Directions in Cloud Computing (*including presentation from Research Scholars*) – after review of papers from reputed journals (*IEEE Transactions on Cloud Computing, IEEE Software, IEEE Computer etc.*)	**4**
Assessment	**2**

References:

- Software Engineering Books – available in Departmental & Central Library of University
- Research Papers – available in reputed Journals (IEEE-Transactions, Springer, ACM etc.)

Pre PhD Course
Network and Security
CS-702

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3 1 0

Unit-1

OSI layered architecture, TCP/IP protocol suite. **Physical Layer:** Transmission Media Guided media, Twisted pair, coaxial cable, fiber optics. Unguided media: radio waves, microwaves & infrared waves. **Data Link Layer:** Random Access protocol ALOHA, CSMA, CSMA/CD. Channelization: Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access. Sliding Window Protocols: Designing and functioning of Go-Back-N, Selective Repeat method

Unit-2

Network Layer: IPv4 Addressing, Classful addressing, classless addressing. Datagram formats for IPv4 and IPv6 addresses. Address mapping protocols: ARP and RARP. Unicast routing: Distance vector routing-RIP and Link state routing-OSPF. Path vector routing-BGP. **Transport Layer:** Process to process delivery, User data gram protocol, Transmission control protocol. Congestion Control: Leaky bucket and token bucket. **Application Layer:** Domain name System: Name space, Domain Name space, Distribution of domain name space

Unit-3

Introduction of ad-hoc/sensor networks: Key definitions of ad-hoc/sensor networks, constraints and characteristics of MANET, challenges & Performance parameters of Adhoc networks, Types & Applications of MANETs, **Wireless sensor networks:** Introduction of sensor network, sensor networks vs. ad-hoc networks, sensor network limitations, Design Issues, Challenges of Wireless sensor network, Energy consumption, Clustering of sensors- regularly placed sensor, randomly distributed sensors.

Unit-4

Routing in Ad Hoc Networks: Introduction, Topology based routing protocol- Proactive routing- DSDV, WRP, TBRPF, OLSR, multipoint relay, Reactive routing- DSR, AODV, Hybrid routing approach- ZRP, CBRP, Position based routing- Location services- DREAM, quorum based location service, GLS, home zone, forwarding strategies- greedy packet forwarding, Restricted Directional flooding- DREAM, LAR, Hierarchical routing.

Unit-5

Security: Introduction to OSI Security Architecture: Conventional Encryption: Conventional Encryption Model, Classical Encryption Techniques - Substitution Ciphers: Transpositions Ciphers: Cryptanalysis. Data Encryption Standards (DES), Principles of Public Key Cryptosystems: RSA Algorithm: Key Management, Diffie-Heilman Key Exchange Algorithm, Message Authentication & Hash Functions. Security of Hash Function & MACS, Authentication Applications: Kerberos Version 4, Viruses and Related Threats: Malicious Programs.

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice Hall, New Jersey.
2. Forouzen,"Data Communication and Networking",TMH
3. A.S.Tanenbaum,"Computer Networks",3rd Edition,Prentice Hall India,1997.
4. AD HOC & SENSOR NETWORK "Theory and Application" by Carlos de Morais Cordeiro, World scientific press.