NATIONAL UNIVERSITY

Syllabus
Department of Computer Science and Engineering

One Year Master's Course
Effective from the Session: 2021-2022

National University

Subject: Computer Science and Engineering (CSE)
Syllabus for One-Year Master's Course
Effective from the Session: 2021-2022

Paper Code	Paper Title	Credits
First Semester (Any four papers from the following)		
610201	Software Project Management	4
610203	Network Routing and Switching	4
610205	Advanced Wireless Communication	4
610207	System Administration	4
610209	Web Application Engineering	4
610211	Decision Support System	4
	Total =	**16**
Second Semester (Any four papers from the following)		
610223	Mobile and Web Programming	4
610225	Data and Web Mining	4
610227	Information Security	4
610229	Cloud Computing	4
610231	Distributed Database Management System	4
610233	Software Quality Assurance	4
	Total =	**16**
610234	Project	4
	Grand Total =	**36**

Detailed Syllabus

First Semester

Course Code : 610201	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Software Project Management		

Course Outline:

Foundations of software project management; organization structure and staffing; motivation, authority and influence; conflict management; proposal preparation; a large engineering software system management; client management; managing software project teams; project planning and scheduling; risk management; configuration management; pricing estimation and cost control; quality assurance and accreditation; factors affecting software quality; software quality assurance plans; business context and legal issues for software projects; software measurement: testing, upgrading and maintenance; network systems; and international project management.

Suggested Books:
1. Software Project Management in Practice: Pankaj Jalote , Addison-Wesley Professional.
2. Introduction to Software Project Management: Adolfo Villafiorita Auerbach Publications, CRC Press.

Course Code : 610203	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Network Routing and Switching		

Course Outline:

Ethernet Networking and Data Encapsulation, Introduction to TCP/IP, Easy Subnetting, VLSMs, Summarization, and Troubleshooting TCP/IP, Cisco's Internetworking Operating System (IOS), Managing a Cisco Internetwork, IP Routing, Open Shortest Path First (OSPF), Layer 2, Switching, VLANs and Inter-VLAN Routing, Security, Network Address Translation (NAT), Internet Protocol Version 6 (IPv6), ICND2, Enhanced Switched Technologies, Managing Cisco Devices, IP Services, Troubleshooting IP, IPv6, and VLANs, Enhanced IGRP, Multi-Area OSPF, Wide Area Networks, Access Control List (ACL).

Suggested Books:
CCNA Routing and Switching: Study Guide

Course Code : 610205	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Advanced Wireless Communication		

Course Outline:

Wireless Medium: Air Interface Design, Radio propagation mechanism, Path-loss modeling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modelling, Simulation of Radio Channel.

Wireless Medium Access: Fixed Assignment Access for Voice Networks, Random Access for Data Networks, Integration of Voice and Data traffic.

Wireless Network Operation: Wireless Network Topologies, Cellular Topology, Cell fundamentals, Signal to Interference Ratio, Capacity Expansion, Mobility Management, Resources and Power Management, Security in Wireless Networks.

Wireless WAN: GSM and TDMA Technology, Mobile Environment, CDMA Technology, IS95, IMT2000, Mobile Data Networks, CDPD Networks, GPRS, Mobile Application Protocol.

Wireless LANs and HiperLANs: Introduction to wireless LANs, IEEE 802.11, WPAN IEEE 802.15 –Mobile Ad Hoc Networks (MANET) - Principle and operation.

IEEE 802.16: WiMAX,

IEEE 802.21: MIH (Media Independent Handover (MIH),

IEEE 802.15.7:Visible Light Communication,

IEEE 802.15.3c: High rate WPAN, WiMedia. Wireless Home Networking, Concepts of Bluetooth Technology.

Suggested Books:

1. Andreas F. Molisch , " Wireless Communications", Wiley, 2nd Edition , 2011.

2. Savo G. Glisic, "Advanced Wireless Communications: 4G Cognitive and Cooperative Broadband Technology", Wiley-Interscience, 2nd edition, 2007.

Course Code : 610207	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	System Administration		

Course Outline:

1. What is System Administration? System Administration Roles, Basics of Unix/Linux, History, System Administration Topics.

2. Basic Info and Account Management, File and Directory layout, File Systems, File permissions.

3. Basic Linux/Unix Commands and tools, Command Line vs. GUI, Start up (booting) and Shutdown, Task Manager, More Account Management.

4. System Processes, Scheduling jobs (scheduler/cron), job monitoring, (event viewer/ps), start and stop jobs, At command vs. Scheduled Tasks, GUI tool, More Task Manager.

5. Disk administration. File systems/partitions, Disk Defragmentation, RAID, Basic client/server file sharing.

6. Files, Directories and Memory Management, Permissions.

7. Networking. TCP/IP, DNS, DHCP, Domains/NIS, File Sharing, Client/Server. Setting up a file server (and client/server network), Ethernet Addresses, Hostnames.

8. Automating System Admin Tasks, Scripts, Shell programming, Perl programming.

9. Performance Monitoring and Optimization.

10. Misc. and Advanced Topics. Other Control Panel and Admin Tools Items, Computer Management GUI tool.

11. Security and Backups. Patches, passwords, kerberos, enigma, Tools (tcpwrappers and others), Backup methods.

12. Installing/upgrading hardware/software, email server, web server, dns/dhcp server, telnet/ftp/ssh, Unix-Windows interoperability (samba), user communications and documentation, problems resolution and solutions, raid, san, nas.

Suggested Books:

1. UNIX and Linux System Administration Handbook by Evi Nemeth , Garth Snyder , Trent R. Hein , Ben Whaley , Dan Mackin.

2. Linux Administration: A Beginner's Guide, 7th Edition, by Wale Soyinka.

Course Code : 610209	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	**Web Application Engineering**		

Course Outline:

Introduction to Web and Web application, Web Essential: Client, Server and Protocols, HTTP request and Response Message, Web Application, CGI, Web server mode, logging. HTML/XHTML, CSS, w3c standard, XML, XML Schema, XML Tag,

XML Structure, XML Namespace, XML processing, SAX, Document Object Model, XML Query, XSLT, Document transformation using XSLT, Server Side Programming, Relation database overview, SQL, Database Design, Data Access Model, Object Relational Mapping, Design Pattern, Presentation Layer Design, Business Layer Design, JSP and Servlet or PHP, JDBC, MVC model, Web tier, Command Design Pattern, Service Locator Pattern, Data Access Object Pattern, Persistent communication, Web Application Security: Policy, Network-level Security: SSL, Application-level Security. SQL-injection, Form modification, cross site scripting, Privacy: P3P, Policies, Procedures Access Control, Authorization and Laws, E-Commerce Payment Systems, Web Application infrastructure: Case Study PHP or J2EE.

Suggested Books:

1. Engineering Web Applications by Casteleyn**, S.,** Daniel**, F.,** Dolog**, P.,** Matera**, M.**
2. Kappel, G., Proll, B. Reich, S. & Retschitzegger, W. (2006). Web Engineering, 1st ed. Hoboken, NJ: Wiley & Sons.

Course Code :	610211	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Decision Support Systems			

Course Outline:

This course aims in teaching the integration of business and technical consideration in the design, implementation and management of information systems. Topics include: Information System planning and development, business, management, executive, and strategic information systems, including case studies of selected large disaster planning and recovery. The course also includes practical examples of information systems industry.

Suggested Books:

1. J. L. Nazareth, John L. Nazareth,"DLP and Extensions: An Optimization Model and Decision Support System", Springer-Verlag Telos, Book & CD-ROM edition, 2001.

2. Handbook on Decision Support Systems, F. Burstein, C. Holsapple (Eds.)

Second Semester

Course Code : 610223	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Mobile and Web Programming		

Course Outline:

Mobile Phones and Network Technologies, History of mobile devices and mobile operating systems, Modern mobile operating systems and their architecture, Introduction to Android Programming, Android Application Frameworks, Building a Simple User Interface, Activities and Intents, Case Study: Calculator App. – Design Challenges, Services, Broadcast Receivers, Data Persistence, Processes and Threads, Asynchronous Tasks, Internet Resources, App Publishing and Business Models, Introduction to iOS platform, Application Development in iOS, Building a Simple User Interface in iOS, Course Project.

Suggested Books:
1. Practical Web Development(eBook), by Paul Wellens, Packt Publishing Ltd.

2. Programming the Mobile Web, by Maximiliano Firtman, Publisher: O'Reilly Media.

Course Code : 610225	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Data and Web Mining		

Course Outline:

Introduction, Data warehousing and OLAP technology for data mining; Data preprocessing; Data mining primitives, languages and systems; Descriptive data mining: characterization and comparison; Association analysis; Classification and prediction; Cluster analysis; Mining complex types of data; Applications and trends in data mining.

Web Mining: Web 1.0, 2.0, 3.0, Search engines: ranking, search logs, search algorithms, Deep web spidering: forums, IRCs, dark web, Social media and crowdsourcing systems: wisdom of the crowd, sentiment analysis, Web systems and computing: web services, APIs, and mesh-ups. Cloud computing and big data analytics: Hadoop, MapReduce, Mahout, Spark, Emerging research in major data and web mining conferences: ACM KDD, IEEE ICDM, WWW, ACM SIGIR, ACM CHI, AAAI, IJCAI, AMIA, WH; Emerging research in major industry research labs: Google, Facebook, Amazon, EBay, Microsoft; Emerging data and web mining applications: health informatics, security informatics.

Suggested Books:

1. Data Mining: The Textbook Charu C. Aggarwal, Springer Publication.

2. Data Mining: Concepts and Techniques, 3rd Edition Jiawei Han, Micheline Kamber, Jian Pei.

Course Code : 610227	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Information Security		

Course Outline:

Introduction to information security: Security architecture, nature of information security risk, Principles of information security, security management process, information security policy, asset analysis, risk analysis. Internet protocol and security: Internet protocol and IP address, TCP/IP protocol suit, port number, www, e-mail, DNS etc. Threat: Types of threat – Vulnerability Exploitation, Denial of service, Spoofing, Eavesdropping, Password cracking, Malware(Viruses, Worm, Spyware, Rootkit, Bot, Botnet), Targeted attack, SPAM Messaging, Phishing Attack, Unintended Information disclosure: search Engine Hacking, peer to peer file sharing. Vulnerability (buffer overflow, stack overflow, heap overflow, sql injection, command injection,css/xcss): memory based, time and state based, string based, design based, ssl. TLS. Security technologies: Cryptography basics, Public key Infrastructure, Digital signature, Communication encryption, Authentication, Challenge and response, Firewall/Intrusion detection, intrusion prevention system, firewall deployment, anti-malware, Quarantine network, backup and restore, web application firewall, secure network system, penetration resting. Wireless security: threat on wireless LAN, countermeasures against threat, ESS-ID exposure, ANY connection, Vulnerability on MAC Address Authentication, Encryption with WEP, PSK mode, EAP. Incident analysis: case study on system log files based on different protocols such as apache, postfix, OpenSSH, apache-ssl, mysql, PostgressSQL, ftp, pop3, irc, proxy, Microsoft IIS, firewall. Forensics: network, hard drive. Network monitoring: iptraf, MRTG/RRDTool, wareshark, tcpdump/snoop, Case Study: CSIRT Activities.

Suggested Books:

1. Information Security Principles and Practice by Mark Stamp, John Wiley & Sons.
2. Principles of Information Security, Michael E. Whitman, Herbert J. Mattord,

Course Code : 610229	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Cloud Computing		

Course Outline:

Enabling Technologies and System Models for Cloud Computing, Introduction to Cloud Computing including benefits, challenges, and risks, Cloud Computing Models including Infrastructure/Platform/Software–as-a-service, Public cloud, private cloud and hybrid clouds, Cloud OS, Cloud Architectures including Federated Clouds, Scalability, Performance, QoS, Data centers for Cloud Computing, Principles of Virtualization platforms, Security and Privacy issues in the Cloud, VMware ESX Memory Management, Capacity Planning and Disaster Recovery in Cloud Computing.

Suggested Books:

1. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mahmood, The Prentice Hall Publication.

2. Cloud Computing: From Beginning to End by Mr. Ray J Rafaels.

Course Code : 610231	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Distributed Database Management System		

Course Outline:

Distributed Database: An Overview, Features of Distributed versus Centralized Databases, Necessity of Distributed Database, Distributed Database Management Systems (DDBMSs).

Levels of Distribution Transparency: Reference Architecture for Distributed Database, Types of Data Fragmentation, Distribution Transparency for Read-Only Applications, Distribution Transparency for Update Applications, Distributed Database Access Primitives, Integrity Constraints in Distributed Databases.

Distributed Database Design: A Framework for Distributed Database Design, Design of Database Fragmentation, Allocation of Fragments.

Translation of Global Queries to Fragment Queries: Equivalence Transformation for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Optimization of Access Strategies: A Framework for Query Optimization, Join Queries, General Queries.

The Management of Distributed Transactions: A Framework for Transaction

Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions.

Concurrency Control: Foundations of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control Based on Timestamps.

Reliability: Basic Concepts, Nonblocking Commitment Protocols, Reliability and Concurrency Control, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart.

Distributed Database Administration: Catalog Management in Distributed Database, Authorization and Protection.

Suggested Books:
Distributed Databases: Principles and Systems: Stefano Ceri, Giuseppe Pelagatti, McGraw-Hill International Editions.

Course Code : 610233	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Software Quality Assurance		

Course Outline:

Overview of Software Quality Assurance (SQA), Defining quality: requirements and specifications, Security as a fundamental aspect of quality, Quality by design: building in quality, Program verification technologies and methods, Inspections and code reviews, Testing methods - white box, black box, control flow, data flow, software development processes & maturity; software quality management process: total quality management, improvement cycle, SQA planning and management, organizing the SQA effort; software verification & validation; typical software development errors; Fagan inspections; software audit; software testing: testing objectives and testing fundamentals, testing theory, coverage criteria, equivalence class testing, value-based testing, Standards for software quality assurance.

Suggested Books:
1. Software Testing and Quality Assurance: Theory and Practice, By Kshirasagar Naik, Priyadarshi Tripathy.

2. Testing and Quality Assurance for Component-based Software
   By Jerry Gao, H.-S. J. Tsao, Ye Wu.

Course Code : 610234	Marks: 100	Credits : 4	Class Hours: 60 hrs.
Course Title :	Project		