

Mahatma Education Society's
Pillai College of Arts, Commerce & Science
(Autonomous)
Affiliated to University of Mumbai
New Panvel



Syllabus for T. Y. B. Sc. IT Semester VI
Program: B. Sc. Information Technology

(Semester based Credit and Grading system for the
academic year 2019-20)

Semester VI

Course Code	Course Type	Course Title	Theory/ Practical	Marks	Credits	Lecture s/Week
PUSIT601	Core	Software Testing	Theory	100	2	5
PUSIT602	Core	Security in Computing	Theory	100	2	5
PUSIT603	Core	Business Intelligence	Theory	100	2	5
Elective I (Select any one)						
PUSIT604	Elective	Principles of Geographic Information Systems	Theory	100	2	5
PUSIT604	Elective	Enterprise Networking				
Elective I (Select any one)						
PUSIT605	Elective	IT Service Management	Theory	100	2	5
PUSIT605	Elective	Cyber laws				
PUSIT601P	Core	Project Implementation	Practical	150	2	3
PUSIT602P	Core	Practical (PUSIT602)	Practical	50	2	3
PUSIT603P	Core	Practical (PUSIT603)	Practical	50	2	3
PUSIT604P	Core	Practical (PUSIT604)	Practical	50	2	3
PUSIT606	Core	Advanced Mobile Programming	Practical	50	2	3
Total				850	20	

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Software Quality Assurance
Subject code	PUSIT601
Level of the Subject	Basic

Objectives :

1. To know the importance of Quality and role of Software Testing in achieving and maintaining the desired quality level.
2. To study fundamental concepts of software testing.

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction to Quality and Testing	1.1	Introduction to Quality: What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Software Quality: Introduction, Quality Management: Quality Control & Quality Assurance	15L
		1.2	Fundamentals of testing: Necessity of testing , Testing definition, Testing principles, Fundamental test process, The psychology of testing.	
2	Testing throughout the software life cycle:	2.1	Software development models : V Model, Waterfall model, Iterative models & Agile	15L
		2.2	Test levels, Test types: the targets of testing, Maintenance testing; Static techniques: Reviews and the test process, Review process, Static analysis by tools	
3	Testing Techniques	3.1	Test design techniques: Identifying test conditions and designing test cases, Categories of test design techniques,	15L
		3.2	Specification-based or black box techniques, Structure-based or white-box techniques, Experience based techniques	

4	Test management	4.1	Test management: Test organization, Test plans, estimates, and strategies, Test progress monitoring and control, Configuration management, Risk and testing, Incident management	15L
		4.2	Tool support for testing: Types of test tool, Effective use of tools: Potential benefits and risks, Introducing a tool into an organization	
Total No. Of Lectures				60

Expected Outcome:

1. Have an ability to apply software testing methods.
2. Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems.

References Books :

1. Software Testing by Yogesh Singh, Cambridge University Press
2. Software Testing Principles, Techniques and Tools, M.G. Limaye, TMH,
3. Software Testing A Craftsman's Approach, Second Edition, Paul C. Jorgensen, CRC Press
4. Introduction to Software Testing, Paul Ammann, Jeff Offutt, Cambridge University Press.
5. Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing, Rex Black, Wiley.
6. Foundations of Software Testing by Dorothy Graham
7. Software Testing, Second Edition, Ron Patton, SAMS

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Security in Computing
Subject code	PUSIT602
Level of the Subject	Advanced

Objectives:

1. This course focuses on the models, tools, and techniques for enforcement of security with some emphasis on the use of cryptography.
2. Students will learn security from multiple perspectives

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Foundations	1.1	Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.	15L
		1.2	Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.	
		1.3	Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	

		1.4	Authentication and Authorization: Authentication, Authorization	
2	Data Security	2.1	Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.	15L
		2.2	Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.	
		2.3	Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.	
		2.4	Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.	
3	Network Security	3.1	Network Device Security: Switch and Router Basics, Network Hardening.	15L
		3.2	Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.	
		3.3	Wireless Network Security: Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	

		3.4	Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).	
4	Computer Security	4.1	Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.	15L
		4.2	Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	
		4.3	Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing	
		4.4	Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.	
Total No. of Lectures				60

Expected Outcome:

1. Identify some of the factors driving the need for network security
2. Identify and classify particular examples of attacks
3. Define the terms vulnerability, threat and attack
4. Identify physical points of vulnerability in simple networks
5. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.

Reference Books:

1. The Complete Reference: Information Security, Mark Rhodes-Ousley, McGraw Hill, 2nd Edition, 2013.
2. Essential Cyber security Science, Josiah Dykstra, O'Reilly Publication, 5th Edition, 2017.

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Security in Computing Practical
Subject code	PUSIT602P
Level of the Subject	Advanced

Practical No.	Details
1.	Graphical User Interface and Command Line Interface and Processes <ul style="list-style-type: none"> a. Installation of RHEL 6.X b. Exploring the Graphical Desktop c. The Command Line Interface d. Managing Processes.
2.	Storage Devices and Links, Backup and Repository <ul style="list-style-type: none"> a. Working with Storage Devices and Links b. Making a Backup c. Creating a Repository
3.	Working with RPMsm Storage and Networking <ul style="list-style-type: none"> a. Using Query Options. b. Extracting Files From RPMs c. Configuring and Managing Storage d. Connecting to the Network.
4.	Working with Users, Groups, and Permissions
5.	Firewall and Cryptographic services <ul style="list-style-type: none"> a. Securing Server with iptables b. Setting Up Cryptographic Services
6.	Configuring Server for File Sharing <ul style="list-style-type: none"> a. Configuring NFS Server and Client b. Configuring Samba

	c. Configuring FTP
7.	DNS, DHCP and Mail Server <ol style="list-style-type: none"> Configuring DNS Configuring DHCP Setting Up a Mail Server
8.	Web Server <ol style="list-style-type: none"> Configuring Apache on Red Hat Enterprise Linux Writing a Script to Monitor Activity on the Apache Web Server Using the select Command
9.	Shell Scripts and High-Availability Clustering <ol style="list-style-type: none"> Writing Shell Scripts to Find Factorial Number, Palindrome Number, Palindrome String, Reverse Number, Armstrong Number, Count of Digit Configuring Booting with GRUB Configuring High Availability Clustering
10.	Setting Up an Installation Server <ol style="list-style-type: none"> Configuring Network Server as an Installation Server Setting Up a TFTP and DHCP Server for PXE Boot

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Business Intelligence
Subject code	PUSIT603
Level of the Subject	Advanced

Objectives :

1. To know the importance of BI and get knowledge of different methodology and models used in BI
2. To study fundamental concepts of BI

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction to Business intelligence	1.1	Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	15L
		1.2	Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models	
2	Methods and models	2.1	Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	15L
		2.2	Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	

	Data Exploration	2.3	Exploration: Graphical analysis of bivariate variables using scatter plots ,Loess plots, Level curves ,box plots	
3	Business intelligence application	3.1	Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.	15L
		3.2	Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	
4	Knowledge management and Artificial Intelligence	4.1	Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management	15L
		4.2	Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	
Total No. Of Lectures				60

Expected Outcome:

1. Students will be able to identify the major frameworks of computerized decision support: decision support systems (DSS), data analytics and business intelligence (BI).
2. They will be able to explain the foundations, definitions, and capabilities of DSS, data analytics and BI

References Books :

Business Intelligence: Data Mining and Optimization for

1. Decision Making, Carlo Vercellis,, Wiley, First, 2009
2. Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, Dursun Delen, Pearson, Ninth, 2011
3. Fundamental of Business Intelligence, Grossmann W, Rinderle-Ma, Springer, First 2015

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Business Intelligence
Subject code	PUSIT603P
Level of the Subject	Advanced

Practical No	Details
1	Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventure works, Northwind, foodmart etc.)
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.
4	a. Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.
5	a. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the datawarehouse data.
7	Perform the data classification using classification algorithm.
8	Perform the data clustering using clustering algorithm.
9	Perform the Linear regression on the given datawarehouse data.
10	Perform the logistic regression on the given datawarehouse data.

The BI tools such as Tableau / Power BI / BIRT / R / Excel or any other can be used.

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Principles of Geographic Information Systems
Subject code	PUSIT604
Level of the Subject	Advanced

Objectives:

The course objectives include

1. To offer the learner the relevant GIS Concepts and Spatial Data and implementation, obtaining a theoretical understanding of GIS
2. Gaining practical experience in Map Making and Analysis using QGIS

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction to GIS	1.1	A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GI Systems, GIScience and GI Applications, Spatial data and Geo information. Components of GIS The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis	15L
		1.2	Geographic Information and Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries	
		1.3	Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic object	

		1.4	Organizing and Managing Spatial Data The Temporal Dimension	
2	Data Management and Processing Systems & Spatial Referencing and Positioning	2.1	Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)	
		2.2	Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.	
		2.3	Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality ,Querying a spatial Database	
		2.4	Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations	
		2.5	Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology	
3	Data Entry and Preparation	3.1	Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere	15L
		3.2	Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, Temporal accuracy, Lineage, Completeness, Logical consistency	
		3.3	Data Preparation: Data checks and repairs, Combining data from multiple sources	
		3.4	Point Data Transformation: Interpolating discrete data, Interpolating continuous data	

4	Spatial Data Analysis & Data Visualization	4.1	<p>Classification of analytical GIS Capabilities</p> <p>Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification</p> <p>Overlay functions: Vector overlay operators, Raster overlay operators</p> <p>Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis</p>	15L
		4.2	<p>Analysis: Network analysis, interpolation, terrain modelling</p> <p>GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances</p> <p>Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation</p>	
		4.3	<p>Data Visualization: GIS and Maps, The Visualization Process Visualization Strategies: Present or explore?</p> <p>The cartographic toolbox: What kind of data do I have?, How can I map my data?</p> <p>How to map?: How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series</p>	
	Total No. Of Lectures			60

Expected Outcomes :

1. Appreciate the relevance of GIS in Map Making and analysis of Spatial Data.
2. Understand the concepts through QGIS and implementation.

Books and References:

1. Principles of Geographic Information Systems- An Introductory Text Book Editors: Otto Huisman and Rolf A. The International Institute of Geoinformation Science and Earth Observation-Fourth Edition ,2009
2. Principles of Geographic Information Systems- P.A Burrough and R.A.McDonnell Oxford
3. University Press-ThirdEdition,1999
4. Fundamentals of Spatial Information Systems,R.Laurini and D. Thompson Academic
5. Press-1994
6. Introduction to Geographic Information Systems,Chang Kang-tsung (Karl) , McGrawHill, Any above 3rd Edition ,2013 7th Edition
7. GIS Fundamentals: A First Text on Geographic Information Systems Paul Bolsatd,XanEdu Publishing Inc,5th Edition

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Principles of Geographic Information Systems
Subject code	PUSIT604P
Level of the Subject	Advanced

Practical No	Details
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files, Using Plugins, Searching and Downloading Open StreetMap Data
4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
8	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
9	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas
10	Validating Map data

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Enterprise Networking
Subject code	PUSIT604
Level of the Subject	Advanced

Objectives:

The course objectives include

1. Learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks,
2. Gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Unit No	Name of Unit	Unit No	Content	No. Of Lectures
1	General Network Design, Network Design Models Enterprise LAN and Data Center Design	1.1	General Network Design: Network Design Methodology, Architectures for the Enterprise, Borderless Networks Architecture, Collaboration and Video Architecture, Data Center and Virtualization Architecture, Design Lifecycle: Plan, Build, Manage Plan Phase Build Phase Manage Phase Prepare, Plan, Design, Implement, Operate, and Optimize Phases Prepare Phase Plan Phase Design Phase Implement Phase Operate Phase Optimize Phase Summary of PPDIOO Phases Project Deliverables Design Methodology Identifying Customer Design Requirements Characterizing the Existing Network Steps in Gathering Information Network Audit Tools Network Checklist Designing the Network Topology and Solutions Top-Down Approach Pilot and Prototype Tests Design Document.	15L

		1.2	<p>Network Design Models: Hierarchical Network Models Benefits of the Hierarchical Model, Hierarchical Network Design, Core Layer, Distribution Layer, Access Layer, Hierarchical Model Examples, Hub-and-Spoke, Design Collapsed Core, Design Enterprise Architecture Model, Enterprise Campus Module, Enterprise Edge Area, E-Commerce Module, Internet Connectivity Module, VPN/Remote Access, Enterprise WAN, Service Provider Edge Module, Remote Modules, Enterprise Branch Module, Enterprise Data Center Module, Enterprise Teleworker Module, High Availability Network Services, Workstation-to-Router Redundancy and LAN, High Availability Protocols, ARP Explicit Configuration, RDP, RIP, HSRP, VRRP, GLBP, Server Redundancy, Route Redundancy, Load Balancing, Increasing Availability, Link Media Redundancy</p>	
		1.3	<p>Enterprise LAN Design: LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules, 1000BASE-LX Long-Wavelength Gigabit Ethernet, 1000BASE-SX Short-Wavelength Gigabit Ethernet, 1000BASE-CX Gigabit Ethernet over Coaxial Cable, 1000BASE-T Gigabit Ethernet over UTP 86, 10 Gigabit Ethernet Design Rules, 10GE Media Types, EtherChannel, Comparison of Campus Media LAN Hardware, Repeaters, Hubs, Bridges, Switches, Routers, Layer 3 Switches, Campus LAN Design and Best Practices Best Practices for Hierarchical Layers, Access Layer Best Practices, Distribution Layer Best Practices, Core Layer Best Practices, STP Design Considerations, STP Toolkit, PortFast, UplinkFast, BackboneFast, Loop Guard, Root Guard, BPDU Guard, BPDU Filter, VLAN and Trunk Considerations, Unidirectional Link Detection (UDLD) Protocol, Large-Building LANs, Enterprise Campus LANs, Edge Distribution, Medium-Size LANs, Small and</p>	

			Remote Site LANs, Server Farm Module, Server Connectivity Options, Enterprise Data Center Infrastructure, Campus LAN QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping.	
		1.4	<p>Data Center Design: Enterprise DC Architecture, Data Center Foundation Components, Data Center Topology Components, Data Center Network Programmability, SDN, Controllers, APIs, ACI, Challenges in the DC, Data Center Facility Aspects, Data Center Space, Data Center Power, Data Center Cooling, Data Center Heat, Data Center Cabling, Enterprise DC Infrastructure, Data Center Storage, Data Center Reference Architecture, Defining the DC Access Layer, Defining the DC Aggregation Layer, Defining the DC Core Layer, Security in the DC, Fabric Extenders, Virtualization Overview, Challenges, Defining Virtualization and Benefits, Virtualization Risks, Types of Virtualization, Virtualization Technologies, VSS, VRF, vPC, Device Contexts, Server Virtualization, Server Scaling, Virtual Switching, Network Virtualization Design Considerations, Access Control, Path Isolation, Services Edge, Data Center Interconnect, DCI Use Cases, DCI Transport Options, DCI L2</p> <p>Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.</p>	
I I	Wireless Design, WAN Technologies and the Enterpris	2.1	Wireless LAN Design: Wireless LAN Technologies, WLAN Standards, ISM and UNII Frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X-2001 Port-Based Authentication, Dynamic WEP Keys and	15

	e Edge: WAN Design		<p>LEAP, Controlling WLAN Access to Servers, WLAN</p> <p>Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intracontroller Roaming, Layer 2 Intercontroller Roaming, Layer 3 Intercontroller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh Design Recommendations, Campus Design Considerations, Power over Ethernet (PoE), Wireless and Quality of Service (QoS), Branch Design Considerations, Local MAC, REAP, Hybrid REAP, Branch Office Controller Options.</p>	
		2.2	<p>WAN Technologies and the Enterprise Edge: WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Frame Relay, Time-Division Multiplexing, Metro Ethernet, SONET/SDH, Multiprotocol Label Switching (MPLS), Dark Fiber, Dense Wavelength-Division Multiplexing, Ordering WAN Technology and Contracts, WAN and Edge Design Methodologies, Response Time, Throughput, Reliability, Bandwidth Considerations, WAN Link Categories, Optimizing Bandwidth Using QoS, Queuing, Traffic Shaping and Policing, Classification, Congestion Management, Priority Queuing, Custom Queuing, Weighted Fair Queuing,</p>	

			Class-Based Weighted Fair Queuing, Low-Latency Queuing, Traffic Shaping and Policing, Link Efficiency, Window Size, DMZ Connectivity, Segmenting DMZs, DMZ Services, Internet Connectivity, Centralized Internet (Branch) vs. Direct Internet (Branch), High Availability for the Internet Edge, VPN Network Design.	
		2.3	<p>WAN Design: Traditional WAN Technologies Hub-and-Spoke Topology</p> <p>Full-Mesh Topology Partial-Mesh Topology Point-to-Point Topology Remote Site Connectivity . Enterprise VPN vs. Service Provider VPN Enterprise Managed VPN: IPsec IPsec Direct Encapsulation Generic Routing Encapsulation IPsec DMVPN IPsec Virtual Tunnel Interface Design GETVPN Service Provider–Managed Offerings ,Metro Ethernet Service Provider VPNs: L2 vs. L3 ,Virtual Private Wire Services VPWS L2 VPN Considerations ,Virtual Private LAN Services VPLS L2 VPN Considerations ,MPLS, MPLS Layer 3 Design Overview MPLS L3 VPN Considerations ,VPN Benefits</p>	
		2.4	<p>WAN Backup Design WAN Backup over the Internet Enterprise WAN Architecture Cisco Enterprise MAN/WAN Enterprise WAN/MAN Architecture Comparison ,Enterprise WAN Components Comparing Hardware and Software Enterprise Branch Architecture Branch Design Branch Connectivity Redundancy for Branches Single WAN Carrier vs. Dual WAN Carriers Single MPLS Carrier Site ,Dual MPLS Carriers</p>	
		2.5	<p>Hybrid WAN: L3 VPN with IPsec VPN ,Internet for Branches Flat Layer 2 vs. Collapsed Core ,Enterprise Branch Profiles Small Branch Design Medium Branch Design Large Branch Design Enterprise Teleworker Design ,ISRs for Teleworkers</p>	

3	Internet Protocol and addressing	3.1	<p>Internet Protocol Version 4 Design, Ipv4 Header ToS Ipv4 Fragmentation Ipv4 Addressing , Ipv4 Address Classes Class A Addresses Class B Addresses , Class C Addresses Class D Addresses Class E Addresses , Ipv4 Address Types Ipv4 Private Addresses NAT , Ipv4 Address Subnets Mask Nomenclature IP Address Subnet Design Example Determining the Network Portion of an IP Address Variable-Length Subnet Masks, Loopback Addresses IP Telephony Networks , Ipv4 Addressing Design Goal of Ipv4 Address Design , Plan for Future Use of Ipv4 Addresses , Performing Route Summarization , Plan for a Hierarchical IP Address Network , Private and Public IP Address and NAT Guidelines , Steps for Creating an Ipv4 Address Plan</p>	15L
		3.2	<p>Case Study: IP Address Subnet Allocation , Address Assignment and Name Resolution , Recommended Practices of IP Address Assignment , BOOTP DHCP DNS , Internet Protocol Version 6 Design, Ipv6 Header Ipv6 Address Representation Ipv4-Compatible Ipv6 Addresses Ipv6 Prefix Representation Ipv6 Address Scope Types and Address Allocations Ipv6 Address Allocations Ipv6 Unicast Address Global Unicast Addresses Link-Local Addresses , Unique Local Ipv6 Address Global Aggregatable Ipv6 Address , Ipv4-Compatible Ipv6 Address Ipv6 Anycast Addresses , Ipv6 Multicast Addresses Ipv6 Mechanisms ICMPv6 , Ipv6 Neighbor Discovery Protocol Ipv6 Name Resolution , Path MTU Discovery Ipv6 Address-Assignment Strategies , Manual Configuration SLAAC of Link-Local Address , SLAAC of Globally Unique Ipv6 Address DHCPv6 , DHCPv6 Lite Ipv6 Security Ipv6 Routing Protocols</p>	
		3.3	<p>RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) for Ipv6</p>	

			<p>, Ipv6 Addressing Design , Planning for Addressing with Ipv6 , Route Summarization with Ipv6 IPV6 Private Addressing</p> <p>IPV6 for the Enterprise Ipv6 Address Allocation , Partly Linked Ipv4 Address into Ipv6, Whole Ipv4 Address Linked into Ipv6</p> <p>Ipv6 Addresses Allocated Per Location and/or Type , Ipv4-to-Ipv6 Transition Mechanisms and Deployment Models , Dual-Stack Mechanism Ipv6 over Ipv4 Tunnels , Protocol Translation Mechanisms Ipv6 Deployment Models , Dual-Stack Model Hybrid Model Service Block Model ,Ipv6 Deployment Model Comparison Ipv6 Comparison with Ipv4 ,OSPF, BGP, Route Manipulation, and IP Multicast,OSPFv2 OSPFv2 Metric OSPFv2 Adjacencies and Hello Timers , OSPFv2 Areas OSPF Area Design Considerations OSPF Router Types OSPF DRs LSA Types Autonomous System External Path Types OSPF Stub Area Types Stub Areas Totally Stubby Areas</p>	
		3.4	<p>NSSAs Virtual Links OSPFv2 Router Authentication , OSPFv2 Summary OSPFv3 OSPFv3 Changes from OSPFv2, OSPFv3 Areas and Router Types OSPFv3 LSAs OSPFv3 Summary</p> <p>BGP BGP Neighbors eBGP iBGP Route Reflectors Confederations BGP Administrative Distance , BGP Attributes, Weight, and the BGP Decision Process</p> <p>BGP Path Attributes Next-Hop Attribute Local Preference Attribute Origin Attribute Autonomous System Path Attribute</p> <p>MED Attribute Community Attribute Atomic Aggregate and Aggregator Attributes Weight BGP Decision Process , BGP Summary, , Route Manipulation PBR Route Summarization</p> <p>Route Redistribution Default Metric OSPF Redistribution Route Filtering Transit Traffic Routing Protocols on the Hierarchical Network Infrastructure IP Multicast Review , Multicast Addresses Layer 3 to Layer 2 Mapping IGMP , IGMPv1 IGMPv2 IGMPv3 CGMP IGMP</p>	

			<p>Snooping , Sparse Versus Dense Multicast Multicast Source and Shared Trees PIM PIM- SM PIM DR Auto-RP PIMv2 Bootstrap Router , DVMRP Ipv6 Multicast Addresses</p>	
4	Managing Security	4.1	<p>Managing Security: Network Security Overview Security Legislation Security Threats Reconnaissance and Port Scanning Vulnerability Scanners Unauthorized Access Security Risks Targets Loss of Availability Integrity Violations and Confidentiality Breaches , Security Policy and Process Security Policy Defined , Basic Approach of a Security Policy Purpose of Security Policies, Security Policy Components Risk Assessment , Risk Index Continuous Security Integrating Security Mechanisms into Network Design Trust and Identity Management , Trust Domains of Trust Identity Passwords Tokens Certificates , Network Access Control Secure Services Encryption Fundamentals Encryption Keys VPN Protocols , Transmission Confidentiality Data Integrity Threat Defense , Physical Security Infrastructure Protection Security Management Solutions Security Solution Network Security Platforms , Trust and Identity Technologies Firewall Fundamentals , Types of Firewalls Next-Gen Firewalls NAT Placement , Firewall Guidelines Firewall ACLs , Identity and Access Control Deployments Detecting and Mitigating Threats IPS/IDS Fundamentals IPS/IDS Guidelines , Threat Detection and Mitigation Technologies , Threat- Detection and Threat-Mitigation Solutions , FirePOWER IPS Security Management Applications , Security Platform Solutions Security Management Network</p>	15L

		4.2	Integrating Security into Network Devices IOS Security , ISR G2 Security Hardware Options Securing the Enterprise , Implementing Security in the Campus Implementing Security in the Data Center Implementing Security in the Enterprise Edge	
		4.3	Network Management Protocols, Simple Network Management Protocol SNMP Components , MIB SNMP Message Versions SNMPv1 SNMPv2 SNMPv3 , Other Network Management Technologies RMON , RMON2 NetFlow Compared to RMON and SNMP , CDP LLDP Syslog	
				Total No. Of Lectures
				60

Expected Outcomes :

1. Appreciate the relevance of Networking in the field of Computer Science.
2. Understand the concepts through program implementation

References:

1. CCDA200-310 Official Cert Guide, Author-Anthony Bruno, CCIE No. 2738 Steve Jordan, CCIE No. 11293 Publisher, Cisco Press
2. Network Warrior, Gary A Donabue, O Reilly, 2011

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Enterprise Networking Practical
Subject code	PUSIT604P
Level of the Subject	Advanced

Practical No	Details
1	Configuring OSPF – I a. Single-Area OSPF Link Costs and Interface Priorities b. Multi-Area OSPF with Stub Areas and Authentication
2	Configuring OSPF – II a. OSPF Virtual Links and Area Summarization b. OSPF over Frame Relay
3	Redistribution and Administrative Distances a. Redistribution Between RIP and OSPF b. Manipulating Administrative Distances
4	BGP a. Configuring BGP with Default Routing b. Using the AS_PATH Attribute c. BGP Route Reflectors and Route Filters
5	IPv6 a. Configuring OSPF for IPv6 b. Configuring 6to4 Tunnels
6	VLANs and EtherChannel a. Static VLANs, VLAN Trunking, and VTP Domains and Modes b. Configuring EtherChannel

7	Spanning Tree Protocol a. Spanning Tree Protocol (STP) Default Behavior b. Modifying Default Spanning Tree Behavior
8	VLAN and Spanning Tree a. Per-VLAN Spanning Tree Behavior b. Multiple Spanning Tree
9	Internal VLAN Routing a. Inter-VLAN Routing with an External Router b. Inter-VLAN Routing with an Internal Route Processor
10	Configure NAT Services

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	IT Service Management
Subject code	PUSIT605
Level of the Subject	Advanced

Objectives:

1. To analyze and determine the present IT infrastructure, services and processes.
2. To create management practices which are futuristic in nature. To formulate a roadmap to elevate the state of the business.

Unit No.	Name of Unit	Topic No.	Content	No. of Lectures
1	Introduction	1.1	IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle, Financial Management	15L
		1.2	Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles	
		1.3	Service Strategy: Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution	

		1.4	Challenges, Critical Success factors and risks: Complexity, Coordination and control, Effectiveness in measurement, Risks	
2	Service Design	2.1	Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models	15L
		2.2	Service Design Processes: Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management Challenges, Critical Success factors and risks: Challenges, Risks	
3	Service Transition & Operation	3.1	Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition Service Transition Processes: Transition planning and support, Change Management, Service Asset Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management	15L
		3.2	Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	
		3.3	Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, Achieving balance in service operations, Providing	

			service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation Service	
		3.4	Operation Processes: Event Management, Incident Management, Request fulfillment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks	
4	Continual Service Improvement	4.1	Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.	15L
		4.2	CSI Process: The seven step improvement process. CSI Methods nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, Organising for CSI: Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training.	
		4.3	Technology considerations: Tools to support CSI activities. Implementing CSI:Critical Considerations for implementing CSI,The start, Governance, CSI and organisational change, Communication Strategy and Plan	

Expected Outcome:

1. IT Service Management Revolutionize the way they operate, communicate and do business. Develop and innovate, gain market advantage and differentiate themselves to their end customers.
2. Drive increased productivity and efficiency, improve business processes, make cost savings, and increase sales and growth.

Reference Books:

1. ITIL V3 Foundation Complete Certification Kit,OGC/TSO,2009
2. 2.ITIL V3 Service Strategy ,OGC/TSO
3. 3.ITIL V3 Service Transition,OGC/TSO
4. 4.ITIL V3 Service Operation,OGC/TSO
5. 5.ITIL Continual Service Improvement,TSO,2011

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Cyber laws
Subject code	PUSIT605
Level of the Subject	Advanced

Objectives:

1. To recognize the developing trends in Cyberlaw and the legislation impacting cyberspace in the current situation.
2. To generate better awareness to battle the latest kinds of cybercrimes impacting all investors in the digital and mobile network.

Unit No.	Name of Unit	Topic No.	Name of Topic	No. of Lectures
1	Introducti on	1.1	Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for “About to Commit” an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment!	15L
		1.2	Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of “Cyber Crime “ and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and Email Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service	

			Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime	
2		2.1	Contracts in the Infotech World: Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts.	15
		2.2	Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act, 2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America	
		2.3	Battling Cyber Squatters and Copyright Protection in the Cyber World: Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works	

3		3.1	Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	15
		3.2	E-Commerce Taxation: Real Problems in the Virtual World: A Tug of War on the Concept of „Permanent Establishment“, Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act, 1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance.	
		3.3	Digital Signature, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	

4		4.1	The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India 12 53 Act, 1934	15
		4.2	Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	
	Total No. Of Lectures			60

Expected Outcome:

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.

Reference Books:

1. CyberLaw Simplified, Vivek Sood, TMH education
2. Cybersecurity Law, Jeff Kosseff, Wiley
3. “Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practices: 1” by Alfreda Dudley and James Braman
4. CyberSecurity Ethics: An introduction, Mary Manjikian
5. Computer Law and Ethics (Computer Science)” by Charles Thies

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Advanced Mobile Programming Practical
Subject code	PUSIT605P
Level of the Subject	Advanced

Practical No.	Details
1	Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals: Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple “Hello World” program.
2	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image),
3	Programming Activities and fragments Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments.
4	Programs related to different Layouts Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.
5	Programming UI elements AppBar, Fragments, UI Components
6	Programming menus, dialog, dialog fragments
7	Programs on Intents, Events, Listeners and Adapters The Android Intent Class, Using Events and Event Listeners
8	Programs on Services, notification and broadcast receivers

9	Database Programming with SQLite
10	Programming threads, handles and asynchronized programs
11	Programming Media API and Telephone API
12	Programming Security and permissions
13	Programming Network Communications and Services (JSON)

BOS	Information Technology
Class	T.Y. B.Sc. I.T.
Semester	VI
Subject Name	Project Implementation
Subject code	PUSIT601P
Level of the Subject	Advanced

Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapters have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.

I. OBJECTIVES

1. Describe the Systems Development Life Cycle (SDLC).
2. Evaluate systems requirements.
3. Complete a problem definition.
4. Evaluate a problem definition.
5. Determine how to collect information to determine requirements.
6. Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.
7. Work on data collection methods for fact finding.
8. Construct and evaluate data flow diagrams.
9. Construct and evaluate data dictionaries.

10. Evaluate methods of process description to include structured English, decision tables and decision trees.
11. Evaluate alternative tools for the analysis process.
12. Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
13. Decide the S/W requirement specifications and H/W requirement specifications.
14. Plan the systems design phase of the SDLC.
15. Distinguish between logical and physical design requirements.
16. Design and evaluate system outputs.
17. Design and evaluate systems inputs.
18. Design and evaluate validity checks for input data.
19. Design and evaluate user interfaces for input.
20. Design and evaluate file structures to include the use of indexes.
21. Estimate storage requirements.
22. Explain the various file update processes based on the standard file organizations.
23. Decide various data structures.
24. Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.
25. Perform normalization for the unnormalized tables for RDBMS related projects
26. Decide the various processing systems to include distributed, client/server, online and others.
27. Perform project cost estimates using various techniques.
28. Schedule projects using both GANTT and PERT charts.
29. Perform coding for the project.
30. Documentation requirements and prepare and evaluate systems documentation.
31. Perform various systems testing techniques/strategies to include the phases of testing.
32. Systems implementation and its key problems.

33. Generate various reports.
34. Be able to prepare and evaluate a final report.
35. Brief the maintenance procedures and the role of configuration management in operations.
36. To decide the future scope and further enhancement of the system.
37. Plan for several appendices to be placed in support with the project report documentation.
38. Decide the various processing systems to include distributed, client/server, online and others.
39. Perform project cost estimates using various techniques.
40. Schedule projects using both GANTT and PERT charts.
41. Perform coding for the project.
42. Documentation requirements and prepare and evaluate systems documentation.
43. Perform various systems testing techniques/strategies to include the phases of testing.
44. Systems implementation and its key problems.
45. Generate various reports.
46. Be able to prepare and evaluate a final report.
47. Brief the maintenance procedures and the role of configuration management in operations.
48. To decide the future scope and further enhancement of the system.
49. Plan for several appendices to be placed in support with the project report documentation.
50. Work effectively as an individual or as a team member to produce correct, efficient, well- organized and documented programs in a reasonable time.
51. Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
52. Develop the ability to assess the implications of work performed.
53. Get good exposure and command in one or more application areas and on the software

54. Develop quality software using the software engineering principles
55. Develop the ability to communicate effectively.

II. TYPE OF THE PROJECT

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. Students are encouraged to work in the areas listed below. However, it is ***not mandatory*** for a Student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

III. SOFTWARE AND BROAD AREAS OF APPLICATION

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,MongoDB
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), TcL/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB

UNIX INTERNALS	Device Drivers, RPC, Threads, Socket programming
NETWORK/WIRELESS TECHNOLOGIES	-
REALTIME OPERATING SYSTEM/ EMBEDDED SKILLS	LINUX, Raspberry Pi, Arduino, 8051
APPLICATION AREAS	Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E-Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming.

IV. INTRODUCTION

The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

1.1 PROJECT REPORT:

- Title Page

- Original Copy of the Approved Proforma of the Project Proposal Certificate of Authenticated work
- Role and Responsibility Form Abstract
- Acknowledgement Table of Contents Table of Figures

CHAPTER 1: INTRODUCTION

- 1.1 Background
- 1.2 Objectives
- 1.3 Purpose, Scope, and Applicability
 - 1.3.1 Purpose
 - 1.3.2 Scope
 - 1.3.3 Applicability
- 1.4 Achievements
- 1.5 Organization of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

- 3.1 Problem Definition
- 3.2 Requirements Specification
- 3.3 Planning and Scheduling
- 3.4 Software and Hardware Requirements
- 3.5 Preliminary Product Description
- 3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

- 4.1 Basic Modules
- 4.2 Data Design
 - 4.2.1 Schema Design
 - 4.2.2 Data Integrity and Constraints

- 4.3 Procedural Design
 - 4.3.1 Logic Diagrams
 - 4.3.2 Data Structures
 - 4.3.3 Algorithms Design
- 4.4 User interface design
- 4.5 Security Issues
- 4.6 Test Cases Design

The documentation should use tools like star UML, Visuo for windows, Rational Rose for design as part of Software Project Management Practical Course. The documentation should be spiral bound for semester V and the entire documentation should be hard bound during semester VI.

CHAPTER 5: IMPLEMENTATION AND TESTING

- 5.1 Implementation Approaches
- 5.2 Coding Details and Code Efficiency
 - 5.2.1 Code Efficiency
- 5.3 Testing Approach
 - 5.3.1 Unit Testing
 - 5.3.2 Integrated Testing
 - 5.3.3 Beta Testing
- 5.4 Modifications and Improvements
- 5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

- 6.1 Test Reports
- 6.2 User Documentation

CHAPTER 7: CONCLUSIONS

- 7.1 Conclusion
 - 7.1.1 Significance of the System
- 7.2 Limitations of the System

7.3 Future Scope of the Project

REFERENCES

GLOSSARY

APPENDIX A

APPENDIX B

V. EXPLANATION OF CONTENTS

Title Page

Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format.

Original Copy of the Approved Proforma of the Project Proposal

Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format.

Certificate of Authenticated work

Sample format of Certificate of Authenticated work is given in Appendix 3 of this block. Students should follow the given format.

Role and Responsibility Form

Sample format for Role and Responsibility Form is given in Appendix 4 of this block. Students should follow the given format.

Abstract

This should be one/two short paragraphs (100-150 words total), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.

Acknowledgements

This should express student's gratitude to those who have helped in the preparation of project.

Table of Contents

The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below.

Table of Figures

List of Figures, Tables, Graphs, Charts etc. along with their page numbers in a table of figures.

Chapter 1: Introduction

The introduction has several parts as given below:

Background: A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with the project work.

Objectives: Concise statement of the aims and objectives of the project. Define exactly what is going to be done in the project; the objectives should be about 30 /40 words.

Purpose, Scope and Applicability: The description of Purpose, Scope, and Applicability are given below:

- **Purpose:** Description of the topic of the project that answers questions on why this project is being done. How the project could improve the system its significance and theoretical framework.

- **Scope:** A brief overview of the methodology, assumptions and limitations. The students should answer the question: What are the main issues being covered in the project? What are the main functions of the project?
 - **Applicability:** The student should explain the direct and indirect applications of their work. Briefly discuss how this project will serve the computer world and people.
- Achievements:** Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? Goals achieved - describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.
- **Organisation of Report:** Summarising the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

Chapter 2: Survey of Technologies

In this chapter Survey of Technologies should demonstrate the students awareness and understanding of Available Technologies related to the topic of the project. The student should give the details of all the related technologies that are necessary to complete the project. The should describe the technologies available in the chosen area and present a comparative study of all those Available Technologies. Explain why the student selected the one technology for the completion of the objectives of the project.

Chapter 3: Requirements and Analysis

Problem Definition: Define the problem on which the students are working in the project. Provide details of the overall problem and then divide the problem in to sub-problems. Define each sub-problem clearly.

Requirements Specification: In this phase the student should define the requirements of the system, independent of how these requirements will be accomplished. The Requirements Specification describes the things in the system and the actions that can be done on these things. Identify the operation and problems of the existing system.

Planning and Scheduling: Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules, known as constraints, which control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry

out the plan. The student should show the Gantt chart and Program Evaluation Review Technique (PERT).

Software and Hardware Requirements: Define the details of all the software and hardware needed for the development and implementation of the project.

- **Hardware Requirement:** In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.
- **Software Requirements:** In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed.
- Preliminary Product Description:** Identify the requirements and objectives of the new system. Define the functions and operation of the application/system the students are developing as project.

Conceptual Models: The student should understand the problem domain and produce a model of the system, which describes the operations that can be performed on the system, and the allowable sequences of those operations. Conceptual Models could consist of complete Data Flow Diagrams, ER diagrams, Object-oriented diagrams, System Flowcharts etc.

Chapter 4: System Design

Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudocode and other documentation.

Basic Modules: The students should follow the divide and conquer theory, so divide the overall problem into more manageable parts and develop each part or module separately. When all modules are ready, the student should integrate all the modules into one system. In this phase, the student should briefly describe all the modules and the functionality of these modules.

Data Design: Data design will consist of how data is organised, managed and manipulated.

- **Schema Design:** Define the structure and explanation of schemas used in the project.
- **Data Integrity and Constraints:** Define and explain all the validity checks and constraints provided to maintain data integrity.
- **Procedural Design:** Procedural design is a systematic way for developing algorithms or procedurals.
- **Logic Diagrams:** Define the systematically flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.

- **Data Structures:** Create and define the data structure used in procedures.
- **Algorithms Design:** With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

User Interface Design: Define user, task, environment analysis and how to map those requirements in order to develop a “User Interface”. Describe the external and internal components and the architecture of user interface. Show some rough pictorial views of the user interface and its components.

Security Issues: Discuss Real-time considerations and Security issues related to the project and explain how the student intends avoiding those security problems. What are the security policy plans and architecture?

Test Cases Design: Define test cases, which will provide easy detection of errors and mistakes with in a minimum period of time and with the least effort. Explain the different conditions in which the students wish to ensure the correct working of the project.

Chapter 5: Implementation and Testing

Implementation Approaches: Define the plan of implementation, and the standards the students have used in the implementation.

Coding Details and Code Efficiency: Students not need include full source code, instead, include only the important codes (algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way.

The student can explain the function of the code with a shot of the output screen of that program code.

- **Code Efficiency:** The student should explain how the code is efficient and how the students have handled code optimisation.
- **Testing Approach:** Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain the approach of testing.
- **Unit Testing:** Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but do confine the test within one module.

- **Integrated Testing:** Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.
- **Modifications and Improvements:** Once the students finish the testing they are bound to be faced with bugs, errors and they will need to modify your source code to improve the system. Define what modifications are implemented in the system and how it improved the system.

Chapter 6: Results and Discussion

Test Reports: Explain the test results and reports based on the test cases, which should show that the project is capable of facing any problematic situation and that it works fine in different conditions. Take the different sample inputs and show the outputs.

User Documentation: Define the working of the software; explain its different functions, components with screenshots. The user document should provide all the details of the product in such a way that any user reading the manual, is able to understand the working and functionality of the document.

Chapter 7: Conclusions

Conclusion: The conclusions can be summarised in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that would have made in the other chapters.

Limitations of the System: Explain the limitations encountered during the testing of the project that the students were not able to modify. List the criticisms accepted during the demonstrations of the project.

Future Scope

Future Scope of the Project describes two things: firstly, new areas of investigation prompted by developments in this project, and secondly, parts of the current work that was not completed due to time constraints and/or problems encountered.

REFERENCES

It is very important that the students acknowledge the work of others that they have used or adapted in their own work, or that provides the essential background or context to the

project. The use of references is the standard way to do this. Please follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports. E.g:

Linhares, A., & Brum, P. (2007). Understanding our understanding of strategic scenarios: What role do chunks play? *Cognitive Science*, 31(6), 89-1007.

<https://doi.org/doi:10.1080/03640210701703725>

Lipson, Charles (2011). Cite right : A quick guide to citation styles; MLA, APA, Chicago, the sciences, professions, and more (2nd ed.). Chicago [u.a.]: University of Chicago Press. p. 187. ISBN 9780226484648.

Elaine Ritchie, J Knite. (2001). *Artificial Intelligence, Chapter 2* , p.p 23 - 44. Tata McGrawHill.

GLOSSARY

If you the students any acronyms, abbreviations, symbols, or uncommon terms in the project report then their meaning should be explained where they first occur. If they go on to use any of them extensively then it is helpful to list them in this section and define the meaning.

APPENDICES

These may be provided to include further details of results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

In particular, if there are technical details of the work done that might be useful to others who wish to build on this work, but that are not sufficiently important to the project as a whole to justify being discussed in the main body of the project, then they should be included as appendices.

VI. SUMMARY

Project development usually involves an engineering approach to the design and development of a software system that fulfils a practical need. Projects also often form an important focus for discussion at interviews with future employers as they provide a detailed example of what the students are capable of achieving. In this course the students can choose your project topic from the lists given in Unit 4: Category-wise Problem Definition.

VII. FURTHER READINGS

1. Modern Systems Analysis and Design; Jeffrey A. Hoffer, Joey F. George,
2. Joseph, S. Valacich; Pearson Education; Third Edition; 2002.
3. ISO/IEC 12207: Software Life Cycle Process
(<http://www.software.org/quagmire/descriptions/iso-iec12207.asp>).
4. IEEE 1063: Software User Documentation (<http://ieeexplore.ieee.org>).
5. ISO/IEC: 18019: Guidelines for the Design and Preparation of User Documentation for Application Software.
6. 5. <http://www.sce.carleton.ca/squall>.
7. 6. <http://en.tldp.org/HOWTO/Software-Release-Practice-HOWTO/documentation.html>.
8. 7. <http://www.sei.cmu.edu/cmm/>

