Academic Council 14/06/2018
Item No: 4.49

UNIVERSITY OF MUMBAI

Syllabus for T.Y.B.Sc.

Programme: B.Sc.

Subject: Information Technology

with effect from the academic year

2018 – 2019


Satish Pradhan Dnyanasadhana College, Thane
Arts, Science & Commerce

Semester – 5			
Course Code	**Course Type**	**Course Title**	**Credits**
USIT501	Skill Enhancement Course	Software Project Management	2
USIT502	Skill Enhancement Course	Internet of Things Advanced Web	2
USIT503	Skill Enhancement Course	Programming	2
USIT504	Discipline Specific Elective (Any One) Discipline Specific Elective (Any One)	Artificial Intelligence	2
USIT505		Linux System Administration	
USIT506		Enterprise Java	2
USIT507		Next Generation Technologies	
USIT5P1		Project Dissertation Internet of	2
USIT5P2		Things Practical	2
USIT5P3	Skill Enhancement Course Practical	Advanced Web Programming Practical	2
USIT5P4	Skill Enhancement Course Practical	Artificial Intelligence Practical	2
USIT5P5	Skill Enhancement Course Practical	Linux Administration Practical	
USIT5P6	Discipline Specific Elective Practical (Any One)* Discipline Specific Elective Practical (Any One)*	Enterprise Java Practical	2
USIT5P7		Next Generation Technologies Practical	
		Total Credits	**20**

(All the practical mentioned in the syllabi are compulsory as per the courses chosen)

Semester – 6			
Course Code	**Course Type**	**Course Title**	**Credits**
USIT601	Skill Enhancement Course	Software Quality Assurance	2
USIT602	Skill Enhancement Course	Security in Computing Business	2
USIT603	Skill Enhancement Course	Intelligence Principles of	2
USIT604	Discipline Specific Elective (Any One)	Geographic Information	2
USIT605	Discipline Specific Elective (Any One)	Systems Enterprise Networking	2
USIT606		IT Service Management	
USIT607		Cyber Laws	
USIT6P1	Skill Enhancement Course Practical	Project Implementation	2
USIT6P2	Skill Enhancement Course Practical	Security in Computing Practical	2
USIT6P3	Skill Enhancement Course Practical	Business Intelligence Practical	2
USIT6P4	Skill Enhancement Course Practical	Principles of Geographic Information Systems Practical	2
USIT6P5	Discipline Specific Elective Practical (Any One)*	Enterprise Networking Practical	2
USIT6P6	Skill Enhancement Course Practical	Advanced Mobile Programming	2
			20
		Total Credits	

***The choice of Practical course is based on the theory Course. For Semester V, USIT504, USIT505, USIT506 and USIT507, the practical courses are USIT5P4, USIT5P5 USIT5P6, USIT5P7. For Semester VI, USIT604, USIT605 the practical courses are USIT6P4, USIT6P5 respectively. Practical Course USIT6P6 is compulsory.**

SEMESTER V


Satish Pradhan Dnyanasadhana College, Thane
Arts, Science & Commerce

B. Sc. (Information Technology)		Semester – V	
Course Name: Software Project Management		Course Code: USIT501	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Introduction to Software Project Management**: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management**: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. **An Overview of Project Planning**: Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning	12
II	**Selection of an Appropriate Project Approach:** Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model. **Software Effort Estimation:** Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point	12

	Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	
III	**Activity Planning:** Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks. **Risk Management**: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts. **Resource Allocation**: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	**12**
IV	**Monitoring and Control**: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). **Managing Contracts**: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. **Managing People in Software Environments**: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	**12**
V	**Working in Teams:** Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. **Software Quality:** Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.	**12**

	Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	TMH	6th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1st	2017
3.	Software Project Management	Walker Royce	Pearson		2005

B. Sc. (Information Technology)		Semester – V	
Course Name: Internet of Things		Course Code: USIT502	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**The Internet of Things: An Overview**: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? **Design Principles for Connected Devices:** Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances. **Internet Principles:** Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	12
II	**Thinking About Prototyping:** Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. **Prototyping Embedded Devices:** Electronics, Sensors, Actuators, Basics, Scaling Up the Electronics, Embedded Computing, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	12
III	**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. **Prototyping Online Components:** Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.	12

IV	**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging. **Business Models:** A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	**12**
V	**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community. **Ethics:** Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	First	2014
2.	Internet of Things – Architecture and Design	Raj Kamal	McGraw Hill	First	2017
3.		Cuno Pfister	O'Reilly	Sixth	2016
4.	Getting Started with the Internet of Things	Matt Richardson and Shawn Wallace	SPD	Third	2018
	Getting Started with Raspberry Pi				

B. Sc. (Information Technology)		Semester – V	
Course Name: Advanced Web Programming		Course Code: USIT503	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Introducing .NET**: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. **The C# Language**: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. **Types, Objects, and Namespaces**: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	12
II	**Web Form Fundamentals**: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. **Form Controls**: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	12
III	**Error Handling, Logging, and Tracing**: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing **State Management**: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options **Styles, Themes, and Master Pages**: Styles, Themes, Master Page Basics, Advanced Master Pages,	12
IV	**ADO.NET Fundamentals**: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. **Data Binding**: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,	12

	The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView **XML**: XML Explained, The XML Classes, XML	
V	Validation, XML Display and Transforms. **Security Fundamentals**: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication. **ASP.NET AJAX**: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015 Murach's	Anne Bohem and Joel Murach	Murach	Third	2016
3.	ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem J. Kanjilal	SPD	Sixth	2016
4.	ASP.NET 4.0 programming		Tata McGraw-Hill		2011
5.	Programming ASP.NET	D.Esposito	Microsoft Press (Dreamtech)		2011
6.	Beginning Visual C# 2010	K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner	Wrox (Wiley)		2010

B. Sc. (Information Technology)		Semester – V	
Course Name: Artificial Intelligence Periods per week (1 Period is 50 minutes)		Course Code: USIT504 (Elective I)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Introduction:** What is Artificial Intelligence? Foundations of AI, history, the state of art AI today. **Intelligent Agents:** agents and environment, good behavior, nature of environment, the structure of agents.	12
II	**Solving Problems by Searching:** Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions. **Beyond Classical Search:** local search algorithms, searching with non- deterministic action, searching with partial observations, online search agents and unknown environments. **Adversarial Search:** Games, optimal decisions in games, alpha-beta pruning, stochastic games, partially observable games, state-of-the-are game programs.	12
III	propositional logic, propositional theorem proving, propositional model checking, agents based on propositional logic. **Logical Agents:** Knowledge base agents, The Wumpus world, logic, effective	12
IV	**First Order Logic:** Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic. **Inference in First Order Logic:** propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.	12
V	**Planning:** Definition of Classical Planning, Algorithms for planning as planning state space search, planning graphs, other classical approaches, analysis of planning approaches, Time, Schedules and resources, hierarchical planning, Planning and Acting in Nondeterministic Domains, multiagent planning, **Knowledge Representation:** Categories and Objects, events, mental events and objects, reasoning systems for categories, reasoning with default information, Internet shopping world	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	3rd	2015

2.	A First Course in Artificial Intelligence	Deepak Khemani	TMH	First	2017
.	Artificial Intelligence: A Rational Approach	Rahul Deva Elaine	Shroff publishers	1st	7
3.	Artificial Intelligence	Rich, Kevin Knight and Shivashankar Nair	TMH	3rd	2018
5.4.	Artificial Intelligence & Soft Computing for Beginners	Anandita Das Bhattacharjee	SPD	1st	2013 2009

B. Sc. (Information Technology)		Semester – V	
Course Name: Linux System Administration		Course Code: USIT505 (Elective I)	
Periods per week (1 Period is 50 minutes)			
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Introduction to Red Hat Enterprise Linux:** Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. **Command Line:** Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files **System Administration Tasks:** Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate **Managing Software:** Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages	12
II	**Configuring and Managing Storage:** Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes **Connecting to the Network:** Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with system-config-network, NetworkManager, Working with NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access	12

	Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes **Securing Server with iptables:** Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT **Setting Up Cryptographic Services:** Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files **Configuring Server for File Sharing:** What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.	
III		**12**
IV	**Configuring DNS and DHCP:** Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server **Setting Up a Mail Server:** Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP **Configuring Apache on Red Hat Enterprise Linux:** Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring	**12**

V	**Introducing Bash Shell Scripting:** Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB. **High-Availability Clustering:** High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems **Setting Up an Installation Server:** Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Configuring TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with system-config-kickstart, Making Manual Modifications to the Kickstart File	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Red Hat Enterprise Linux 6 Administration	Sander van Vugt	John Wiley and Sons		2013
2.	Red hat Linux Networking and System Administration	Terry Collings and Kurt Wall	Wiley	3rd	
3.	Linux Administration: A Beginner's Guide	Wale Soyinka	TMH	Fifth Edition	

B. Sc. (Information Technology)		Semester – V	
Course Name: Enterprise Java Periods per week (1 Period is 50 minutes)		Course Code: USIT506 (Elective II)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server **Java EE Architecture, Server and Containers:** Types of System Architecture, Java EE Server, Java EE Containers. **Introduction to Java Servlets:** The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet **Working with Servlets:** Getting Started, Using Annotations Instead of Deployment Descriptor. **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	12
II	**Request Dispatcher:** Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application. **COOKIES:** Kinds of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing the Colors of A Page **SESSION:** What Are Sessions? Lifecycle of Http Session, Session Tracking With Servlet API, A Servlet Session Example **Working with Files:** Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application. **Working with Non-Blocking I/O:** Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp	12
III	**Introduction To Java Server Pages:** Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages **Getting Started With Java Server Pages:** Comments, JSP Document, JSP Elements, JSP GUI Example. **Action Elements:** Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean. **Implicit Objects, Scope and El Expressions:** Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified EL], Expression Language.	12

	Java Server Pages Standard Tag Libraries: What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.	
IV	**Introduction To Enterprise Javabeans:** Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans **Working with Session Beans:** When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans. **Working with Message Driven Beans:** Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example. **Interceptors:** Request and Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. **Java Naming and Directory Interface**: What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE. **Persistence, Object/Relational Mapping And JPA:** What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping,	**12**
V	**Introduction to Java Persistence API:** The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. **Writing JPA Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running the JPA Application. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works? **Writing Hibernate Application:** Application Requirements, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.	**12**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Java EE 7 For Beginners	Sharanam Shah, Vaishali Shah	SPD	First	2017
2.	Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development	Elder Moraes	Packt	First	2018
3.	Advanced Java Programming	Uttam Kumar Roy	Oxford Press		2015

B. Sc. (Information Technology)		Semester – V	
Course Name: Next Generation Technologies Periods per week (1 Period is 50 minutes),		Course Code: USIT507 (Elective II)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Big Data:** Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies **NoSQL:** SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases **Introducing MongoDB:** History, MongoDB Design Philosophy, Speed, Scalability, and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison	12
II	**The MongoDB Data Model:** The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object-Oriented Programming, Schema Evolution **Using MongoDB Shell:** Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application's Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach **MongoDB Architecture:** Core Processes, mongod, mongo, mongos, MongoDB Tools, Standalone Deployment, Replication, Master/Slave Replication, Replica Set, Implementing Advanced Clustering with Replica Sets, Sharding, Sharding Components, Data Distribution Process, Data Balancing Process, Operations, Implementing Sharding, Controlling Collection Distribution (Tag-Based Sharding), Points to	12

	Remember When Importing Data in a ShardedEnvironment, Monitoring for Sharding, Monitoring the Config Servers, Production Cluster Architecture, Scenario 1, Scenario 2, Scenario 3, Scenario 4	
III	**MongoDB Storage Engine:** Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS, GridFSunder the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations **MongoDB Use Cases:** Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding **MongoDB Limitations:** MongoDB Space Is Too Large (Applicable for MMAPv1), Memory Issues (Applicable for Storage Engine MMAPv1), 32-bit vs. 64-bit, BSON Documents, Namespaces Limits, Indexes Limit, Capped Collections Limit - Maximum Number of Documents in a Capped Collection, Sharding Limitations, Shard Key Limitations, Early to Avoid Any Issues, Shard Key Can't Be Updated, Shard Collection Limit, Select the Correct Shard Key, Security Limitations, No Authentication by Default, Traffi c to and from MongoDB Isn't Encrypted, Write and Read Limitations, Case-Sensitive Queries, Type-Sensitive Fields, No JOIN, Transactions, MongoDB Not Applicable	**12**
IV		**12**
V	**MongoDB Best Practices:** Deployment, Hardware Suggestions from the MongoDB Site, Few Points to be Noted, Coding, Application Response Time Optimization, Data Safety, Administration, Replication Lag, Sharding, Monitoring **The End of Disk? SSD and In-Memory Databases:** The End of Disk?, Solid State Disk, The Economics of Disk, SSD-Enabled Databases, In-Memory Databases, TimesTen, Redis, SAP HANA,	**12**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Practical MongoDB	Shakuntala Gupta Edward Navin Sabharwal	Apress		
2	Beginning jQuery	Jack Franklin Russ Ferguson	Apress	Second	
.	Next Generation Databases	Guy Harrison Ben Smith	Apress		
3	Beginning JSON		Apress		
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B. Sc. (Information Technology)		Semester – V	
Course Name: Project Dissertation		Course Code: USIT5P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

The details are given in Appendix – I

B. Sc. (Information Technology)		Semester – V	
Course Name: Internet of Things Practical		Course Code: USIT5P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
	Displaying different LED patterns with Raspberry Pi.
1	
	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
2	
	Raspberry Pi Based Oscilloscope
3	
	Controlling Raspberry Pi with WhatsApp.
4	
	Setting up Wireless Access Point using Raspberry Pi
5	
	Fingerprint Sensor interfacing with Raspberry Pi
6	
	Raspberry Pi GPS Module Interfacing
7	
	IoT based Web Controlled Home Automation using Raspberry Pi
8	
	Visitor Monitoring with Raspberry Pi and Pi Camera
9	
	Interfacing Raspberry Pi with RFID.
10	
	Building Google Assistant with Raspberry Pi.
11	
	Installing Windows 10 IoT Core on Raspberry Pi
12	

Raspberry Pi Kits and components should be made available in the ratio of 1 kit : 3 students minimum.

B. Sc. (Information Technology)		Semester – V	
Course Name: Advanced Web Programming Practical		Course Code: USIT5P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	**Working with basic C# and ASP .NET**
a.	Create an application that obtains four int values from the user and displays the product.
b.	Create an application to demonstrate string operations.
c.	Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.
d.	Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number.
2.	**Working with Object Oriented C# and ASP .NET**
a.	Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion
b.	Create simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces
c.	Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling
3.	**Working with Web Forms and Controls**
a.	Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example : AutoPostBack)
b.	Demonstrate the use of Calendar control to perform following operations. a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendar dates
c.	Demonstrate the use of Treeview control perform following operations. a) Treeview control and datalist b) Treeview operations
4.	**Working with Form Controls**
a.	Create a Registration form to demonstrate use of various Validation controls.
b.	Create Web Form to demonstrate use of Adrotator Control.
c.	Create Web Form to demonstrate use User Controls.

5.	**Working with Navigation, Beautification and Master page.**
a.	Create Web Form to demonstrate use of Website Navigation controls and Site Map.
b.	Create a web application to demonstrate use of Master Page with applying Styles and
c.	Themes for page beautification.
	Create a web application to demonstrate various states of ASP.NET Pages.
6.	
a.	**Working with Database**
b.	Create a web application bind data in a multiline textbox by querying in another textbox.
c.	Create a web application to display records by using database.
7.	Demonstrate the use of Datalist link control.
a.	**Working with Database**
b.	Create a web application to display Databinding using dropdownlist control.
c.	Create a web application for to display the phone no of an author using database.
	Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).
	Working with data controls
8.	Create a web application to demonstrate various uses and properties of SqlDataSource.
a.	Create a web application to demonstrate data binding using DetailsView and FormView
b.	Control.
c.	Create a web application to display Using Disconnected Data Access and Databinding using GridView.
	Working with GridView control
9.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
a.	
b.	Create a web application to demonstrate use of GridView button column and GridView
c.	events.
	Create a web application to demonstrate GridView paging and Creating own table format using GridView.
10.	**Working with AJAX and XML**
a.	Create a web application to demonstrate reading and writing operation with XML.
b.	Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.
c.	Create a web application to demonstrate use of various Ajax controls.
11.	**Programs to create and use DLL**

B. Sc. (Information Technology)		Semester – V	
Course Name: Artificial Intelligence Practical		Course Code: USIT5P4 (Elective I)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

Practical No		Details
1	a	Write a program to implement depth first search algorithm.
	b	Write a program to implement breadth first search algorithm.
2	a	Write a program to simulate 4-Queen / N-Queen problem.
3	b	Write a program to solve tower of Hanoi problem.
4	a	Write a program to implement alpha beta search.
	b	Write a program for Hill climbing problem.
5	a	Write a program to implement A* algorithm.
	b	Write a program to implement AO* algorithm.
6	a	Write a program to solve water jug problem.
7	b	Design the simulation of tic – tac – toe game using min-max algorithm.
	a	Write a program to solve Missionaries and Cannibals problem.
8	b	Design an application to simulate number puzzle problem.
9	a	Write a program to shuffle Deck of cards.
	b	Solve traveling salesman problem using artificial intelligence technique.
10	a	Solve the block of World problem.
	b	Solve constraint satisfaction problem
	a	Derive the expressions based on Associative law
	b	Derive the expressions based on Distributive law
	a	Write a program to derive the predicate. (for e.g.: Sachin is batsman , batsman is cricketer) - > Sachin is Cricketer.
	b	Write a program which contains three predicates: male, female, parent. Make rules for following family relations: father, mother, grandfather,grandmother, brother, sister, uncle, aunt, nephew and niece, cousin. Question: i. Draw Family Tree. ii. Define: Clauses, Facts, Predicates and Rules with conjunction and disjunction

The practicals can be implemented in C / C++ / Java/ Python / R /Prolog / LISP or any other language.

B. Sc. (Information Technology)		Semester – V	
Course Name: Linux System Administration		Course Code: USIT5P5 (Elective I)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
0	**Installation of RHEL 6.X**
1	**Graphical User Interface and Command Line Interface and Processes**
a	Exploring the Graphical Desktop
b	The Command Line Interface
c	Managing Processes
2	**Storage Devices and Links, Backup and Repository**
b	Working with Storage Devices and Links
a	Making a Backup
b	Creating a Repository
3	**Working with RPMsm Storage and Networking**
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**
a	Securing Server with iptables
b	Setting Up Cryptographic Services
6	**Configuring Server for File Sharing**
a	Configuring NFS Server and Client
b	Configuring Samba
c	Configuring FTP
7	**DNS, DHCP and Mail Server**
a	Configuring DNS
b	Configuring DHCP
c	Setting Up a Mail Server
8	**Web Server**
a	Configuring Apache on Red Hat Enterprise Linux

b	Writing a Script to Monitor Activity on the Apache Web Server
c	Using the select Command
9	**Shell Scripts and High-Availability Clustering**
a	Writing Shell Scripts
b	Configuring Booting with GRUB
c	Configuring High Availability Clustering
10	**Setting Up an Installation Server**
a	Configuring Network Server as an Installation Server
b	Setting Up a TFTP and DHCP Server for PXE Boot

B. Sc. (Information Technology)		Semester – V	
Course Name: Enterprise Java Periods per week (1 Period is 50 minutes)		Course Code: USIT5P6 (Elective II)	
Credits		3	
Evaluation System		2	
		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

List of Practical	
1.	**Implement the following Simple Servlet applications.**
a.	Create a simple calculator application using servlet.
b.	Create a servlet for a login page. If the username and password are correct then it says message “Hello <username>” else a message “login failed”
c.	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
	Implement the following Servlet applications with Cookies and Sessions.
2.	
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
b.	Create a servlet that uses Cookies to store the number of times a user has visited servlet.
c.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.
	Implement the Servlet IO and File applications.
3.	
a.	Create a Servlet application to upload and download a file.
b.	Develop Simple Servlet Question Answer Application using Database.
c.	Create simple Servlet application to demonstrate Non-Blocking Read Operation.
	Implement the following JSP applications.
4.	
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
b.	
c.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
	Implement the following JSP JSTL and EL Applications.
5.	
a.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
b.	Create a JSP page to demonstrate the use of Expression language.
c.	Create a JSP application to demonstrate the use of JSTL.

6.	**Implement the following EJB Applications.**
a.	Create a Currency Converter application using EJB.
b.	Develop a Simple Room Reservation System Application Using EJB.
c.	Develop simple shopping cart application using EJB [Stateful Session Bean].
7.	**Implement the following EJB applications with different types of Beans.**
a.	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
b.	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
c.	Develop simple Marks Entry Application to demonstrate accessing Database using EJB.
	Implement the following JPA applications.
8.	Develop a simple Inventory Application Using JPA.
a.	Develop a Guestbook Application Using JPA.
b.	Create simple JPA application to store and retrieve Book details.
c.	**Implement the following JPA applications with ORM and Hibernate.**
9.	Develop a JPA Application to demonstrate use of ORM associations.
a.	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
b.	Develop a Hibernate application to store and retrieve employee details in MySQL Database.
c.	
10.	**Implement the following Hibernate applications.**
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.
b.	Develop Hibernate application to enter and retrieve course details with ORM Mapping.
c.	Develop a five page web application site using any two or three Java EE Technologies.

B. Sc. (Information Technology)		Semester – V	
Course Name: Next Generation Technologies Practical Periods per week (1 Period is 50 minutes)		Course Code: USIT5P7 (Elective II)	
Credits		3	
Evaluation System		2	
		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
1	**MongoDB Basics**
a	Write a MongoDB query to create and drop database.
b	Write a MongoDB query to create, display and drop collection
c	Write a MongoDB query to insert, query, update and delete a document.
2	**Simple Queries with MongoDB**
3	**Implementing Aggregation**
a	Write a MongoDB query to use sum, avg, min and max expression.
b	Write a MongoDB query to use push and addToSet expression.
c	Write a MongoDB query to use first and last expression.
4	**Replication, Backup and Restore**
a	Write a MongoDB query to create Replica of existing database.
b	Write a MongoDB query to create a backup of existing database.
c	Write a MongoDB query to restore database from the backup.
5	**Java and MongoDB**
a	Connecting Java with MongoDB and inserting, retrieving, updating and deleting.
	PHP and MongoDB
6	Connecting PHP with MongoDB and inserting, retrieving, updating and
a	deleting.
	Python and MongoDB
7	Connecting Python with MongoDB and inserting, retrieving, updating and
a	deleting.
	Programs on Basic jQuery
8	jQuery Basic, jQuery Events
a	jQuery Selectors, jQuery Hide and Show effects
b	jQuery fading effects, jQuery Sliding effects
c	

9	**jQuery Advanced**
a	jQuery Animation effects, jQuery Chaining
b	jQuery Callback, jQuery Get and Set Contents
c	jQuery Insert Content, jQuery Remove Elements and Attribute
10	**JSON**
a	Creating JSON
b	Parsing JSON
c	Persisting JSON
11	**Create a JSON file and import it to MongoDB**
a	Export MongoDB to JSON.
b	Write a MongoDB query to delete JSON object from MongoDB

SEMESTER VI


Satish Pradhan Dnyanasadhana College, Thane
Arts, Science & Commerce

B. Sc. (Information Technology)		Semester – VI	
Course Name: Software Quality Assurance		Course Code: USIT601	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**Introduction to Quality:** Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools. **Software Quality:** Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.	12
II	**Fundamentals of testing:** Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester,	12

	Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing **Unit Testing: Boundary Value Testing:**	
III	Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, **Equivalence Class Testing:** Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. **Decision Table–Based Testing:** Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, **Path Testing:** Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, **Data Flow Testing:** Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	**12**
IV	**Software Verification and Validation:** Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis od Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. **V-test Model:** Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.	**12**
V	**Levels of Testing:** Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages. **Special Tests:** Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.	**12**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Software Testing and Continuous Quality Improvement	William E. Lewis	CRC Press	Third	2016
2	Software Testing: Principles, Techniques and Tools	M. G. Limaye	TMH		2017
3.	Foundations of Software Testing	Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black	Cengage Learning	3rd	
4.	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4th	2017

B. Sc. (Information Technology)		Semester – VI	
Course Name: Security in Computing		Course Code: USIT602	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**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. **Risk Analysis**: Threat Definition, Types of Attacks, Risk Analysis. **Secure Design Principles**: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	12
II	**Authentication and Authorization**: Authentication, Authorization **Encryption**: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. **Storage Security**: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. **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.	12
III	**Secure Network Design**: Introduction to Secure Network Design, Performance, Availability, Security. **Network Device Security**: Switch and Router Basics, Network Hardening. **Firewalls**: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. **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.	12
IV	**Intrusion Detection and Prevention Systems**: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). **Voice over IP (VoIP) and PBX Security**: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. **Operating System Security Models**: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	12

V	**Virtual Machines and Cloud Computing**: Virtual Machines, Cloud Computing. **Secure Application Design**: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security. **Physical Security**: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Complete Reference: Information Security	Mark Rhodes-Ousley	McGraw-Hill	2nd Fifth	2013 2017
2.	Essential Cybersecurity Science	Josiah Dykstra	O'Reilly	Second	2010
3.	Principles of Computer Security: CompTIA Security+ and Beyond	Wm.Arthur Conklin, Greg White	McGraw Hill		

B. Sc. (Information Technology)		Semester – VI	
Course Name: Business Intelligence		Course Code: USIT603	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**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	12
II	**Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models **Data mining:** Definition of data mining, Representation of input data , Data mining process, Analysis methodologies **Data preparation**: Data validation, Data transformation, Data reduction	12
III	**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	12
IV	**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. **Data envelopment analysis**: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	12
V	**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 **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	12

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Business Intelligence: Data Mining and Optimization for 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

B. Sc. (Information Technology)		Semester – VI	
Course Name: Principles of Geographic Information Systems		Course Code: USIT604 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**A Gentle Introduction to GIS** **The nature of GIS:** Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. **The real world and representations of it:** Models and modelling, Maps, Databases, Spatial databases and spatial analysis **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 **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 objects **Organizing and Managing Spatial Data** **The Temporal Dimension**	12
II	**Data Management and Processing Systems** **Hardware and Software Trends** **Geographic Information Systems:** GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) **Stages of Spatial Data handling:** Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. **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. **Spatial Referencing and Positioning**	12
III	**Spatial Referencing:** Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations	12

	Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology **Data Entry and Preparation** **Spatial Data Input:** Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere **Data Quality:** Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency **Data Preparation:** Data checks and repairs, Combining data from multiple sources **Point Data Transformation:** Interpolating discrete data, Interpolating continuous data **Spatial Data Analysis**	
IV	**Classification of analytical GIS Capabilities** **Retrieval, classification and measurement:** Measurement, Spatial selection queries, Classification **Overlay functions:** Vector overlay operators,Raster overlay operators **Neighbourhood functions:** Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis **Analysis:** Network analysis, interpolation, terrain modeling **GIS and Application models:** GPS, Open GIS Standards, GIS Applications and Advances **Error Propagation in spatial data processing:** How Errors propagate, Quantifying error propagation **Data Visualization**	**12**
V	**GIS and Maps, The Visualization Process** **Visualization Strategies: Present or explore?** **The cartographic toolbox:** What kind of data do I have? How can I map my data? **How to map?** How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series **Map Cosmetics, Map Dissemination**	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
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	2009

2.	Principles of Geographic Information Systems	P.A Burrough and R.A.McDonnell R.Laurini and D.	Oxford University Press	Third	1999
3.	Fundamentals of Spatial Information Systems,	Thompson, Michael N.Demers	Academic Press		1994
4.	Fundamentals of Geographic Information Systems		Wiley Publications McGrawHill	Fourth	2009
5.	Introduction to Geographic Information Systems GIS Fundamentals: A	Chang Kang-tsung (Karl),		Any above 3rd Edition	2013 7th Edition
6.	First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5th Edition	

B. Sc. (Information Technology)		Semester – VI	
Course Name: Enterprise Networking Periods per week (1 Period is 50 minutes)		Course Code: USIT605 (Elective II)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**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 **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 **Enterprise LAN Design:** LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules,	12
II	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,	12

	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 Remote Site LANs, Server Farm Module, Server Connectivity Options, QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping. **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 Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.	
III	**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 LEAP, Controlling WLAN Access to Servers, WLAN 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. **WAN Technologies and the Enterprise Edge:** WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise	**12**

	Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Ethernet, Frame Relay, Time-Division Multiplexing, Metro 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, 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. **WAN Design** Traditional WAN Technologies Hub-and-Spoke Topology 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 WAN Backup Design WAN Backup over the Internet Enterprise WAN Architecture Cisco Architecture Enterprise MAN/WAN Enterprise WAN/MAN 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 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	
IV	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	**12**

Hierarchical IP Address Network , Private and Public IP Address and NAT Guidelines , Steps for Creating an IPv4 Address Plan 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 RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) for IPv6 , IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing IPv6 for the Enterprise IPv6 Address Allocation , Partly Linked IPv4 Address into IPv6, Whole IPv4 Address Linked into IPv6 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 , NSSAs Virtual Links OSPFv2 Router Authentication , OSPFv2 Summary OSPFv3 OSPFv3 Changes from OSPFv2, OSPFv3 Areas and Router Types OSPFv3 LSAs OSPFv3 Summary BGP BGP Neighbors eBGP iBGP Route Reflectors Confederations BGP Administrative Distance, BGP Attributes, Weight, and the BGP Decision Process BGP Path Attributes Next-Hop Attribute Local Preference Attribute Origin Attribute Autonomous System Path Attribute MED Attribute Community Attribute Atomic Aggregate and Aggregator Attributes Weight BGP Decision Process, BGP Summary, Route Manipulation PBR Route Summarization 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 Snooping, Sparse Versus Dense Multicast Multicast Source and Shared

	Trees PIM PIM-SM PIM DR Auto-RP PIMv2 Bootstrap Router, DVMRP IPv6 Multicast Addresses Managing Security	
V	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 Deployments Guidelines , Firewall ACLs , Identity and Access Control 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 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 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	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	CCDA200-310Official Cert Guide	ANTHONY BRUNO, CCIE No. 2738 STEVE JORDAN CCIE No. 11293	**Cisco Press**		
2.	Network Warrior	Gary A Donabue	**O Reilly**	2nd	2011

B. Sc. (Information Technology)		Semester – VI	
Course Name: IT Services Management Periods per week (1 Period is 50 minutes),		Course Code: USIT606 (Elective I)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**IT Service Management:** Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle. **Service Strategy Principles:** Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles. **Service Strategy:** Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution. **Challenges, Critical Success factors and risks:** Challenges, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.	12
II	**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 **Service Design Processes:** Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, Security, IT Service Continuity Management, Information Management, Supplier Management **Challenges, Critical Success factors and risks:** Challenges, Risks	12
III	**Service Transition:** Fundamentals, **Service Transition Principles:** Policies for Service Transition, Principles Supporting Service Transition, Transition **Service Transition Processes:** Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management. **Challenges, Critical Success factors and risks:** Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	12
IV	**Service Operation:** Fundamentals, **Service Operation Principles:** Functions, groups, teams, departments and divisions, a chieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation	12

	Service Operation Processes: Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. **Challenges, Critical Success factors and risks:** Challenges, Critical Success factors, Risks **Continual Service Improvement(CSI) Principles:** CSI Approach,	
V	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. **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. **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.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	ITIL v3 Foundation Complete Certification Kit				2009
2.	ITIL v3 Service Strategy		OGC/TSO		
3.	ITIL v3 Service Transition		OGC/TSO		
4.	ITIL v3 Service Operation		OGC/TSO TSO		
5.	ITIL Continual Service Improvement			2011	2011

B. Sc. (Information Technology)		Semester – VI	
Course Name: Cyber Laws Periods per week (1 Period is 50 minutes)		Course Code: USIT607 (Elective I)	
Credits		5	
Evaluation System		2	
		Hours	Marks
	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**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! **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 E-mail 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.	12
II	**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. **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.	12
III	**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, Copyright	12

	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.	
IV	**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.	**12**
V	**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! **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 Act, 1934. **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	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH		200 1
2.	Cybersecurity Law	Jeff Kosseff	Wiley		201 7

B. Sc. (Information Technology)		Semester VI	
Course Name: Project Implementation		Course Code: USIT6P1	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	150
	Internal	--	-

The details are given in Appendix – I

B. Sc. (Information Technology)		Semester VI	
Course Name: Security in Computing Practical		Course Code: USIT6P2	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
1	**Configure Routers**
a	OSPF MD5 authentication.
b	NTP.
c	to log messages to the syslog server.
d	to support SSH connections.
2	**Configure AAA Authentication**
a	Configure a local user account on Router and configure authenticate on the console
b	and vty lines using local AAA
3	Verify local AAA authentication from the Router console and the PC-A client
a	**Configuring Extended ACLs**
4	**Configure, Apply and Verify an Extended Numbered ACL**
a	**Configure IP ACLs to Mitigate Attacks and IPV6 ACLs**
b	Verify connectivity among devices before firewall configuration.
c	Use ACLs to ensure remote access to the routers is available only from
d	management station PC-C. Configure ACLs on to mitigate attacks.
5	Configuring IPv6 ACLs
6	**Configuring a Zone-Based Policy Firewall**
a	Configure IOS Intrusion Prevention System (IPS) Using the CLI
b	Enable IOS IPS.
7	Modify an IPS signature.
a	**Layer 2 Security**
b	Assign the Central switch as the root bridge.
c	
8	Secure spanning-tree parameters to prevent STP manipulation attacks.
9	Enable port security to prevent CAM table overflow attacks.
	Layer 2 VLAN Security
	Configure and Verify a Site-to-Site IPsec VPN Using CLI

10	**Configuring ASA Basic Settings and Firewall Using CLI**
a	Configure basic ASA settings and interface security levels using CLI
b	Configure routing, address translation, and inspection policy using CLI
c	Configure DHCP, AAA, and SSH
d	Configure a DMZ, Static NAT, and ACLs

B. Sc. (Information Technology)		Semester VI	
Course Name: Business Intelligence Practical		Course Code: USIT6P3	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	-

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 Adventureworks, Northwind, foodmart etc.) Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
2	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.
3	a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.
4	a. Import the datawarehouse 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.
5	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
6	Perform the data classification using classification algorithm. Perform the data clustering using clustering algorithm.
7	Perform the Linear regression on the given data warehouse data.
8	Perform the logistic regression on the given data warehouse data.
9	
10	

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

B. Sc. (Information Technology)		Semester –VI	
Course Name: Principles of Geographical Information System Practical		Course Code: USIT6P4 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	-

Practical No	Details
0	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
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 Making a Map, Working with Attributes, Importing Spreadsheets or CSV files
3	Using Plugins, Searching and Downloading OpenStreetMap Data Working with attributes, terrain Data
4	Working with Projections and WMS Data
5	Georeferencing Topo Sheets and Scanned Maps
6	Georeferencing Aerial Imagery Digitizing Map Data Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
7	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
8	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler
9	Automating Map Creation with Print Composer Atlas Validating Map data
10	

B. Sc. (Information Technology)		Semester –VI	
Course Name: Advanced Networking Practical		Course Code: USIT6P5 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	-

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**

B. Sc. (Information Technology)		Semester – VI	
Course Name: Advanced Mobile Programming Practical		Course Code: USIT6P6	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2½	50
	Internal	--	--

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 **Programs on Services, notification and broadcast receivers**
8	**Database Programming with SQLite**
9	**Programming threads, handles and asynchronized programs**
10	**Programming Media API and Telephone API**
11	**Programming Security and permissions**
12	**Programming Network Communications and Services (JSON)**
13	

APPENDIX – 1


Satish Pradhan Dnyanasadhana College, Thane
Arts, Science & Commerce

Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter 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

- Describe the Systems Development Life Cycle (SDLC).
- Evaluate systems requirements.
- Complete a problem definition.
- Evaluate a problem definition.
- Determine how to collect information to determine requirements.
- Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.
- Work on data collection methods for fact finding.
- Construct and evaluate data flow diagrams.
- Construct and evaluate data dictionaries.
- Evaluate methods of process description to include structured English, decision tables and decision trees.
- Evaluate alternative tools for the analysis process.
- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
- Decide the S/W requirement specifications and H/W requirement specifications.
- Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- Design and evaluate system outputs.
- Design and evaluate systems inputs.
- Design and evaluate validity checks for input data.

Design and evaluate user interfaces for input. Design and evaluate file structures to include the use of indexes. Estimate storage requirements. Explain the various file update processes based on the standard file organizations. Decide various data structures. Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects. Perform normalization for the unnormalized tables for RDBMS related projects Decide the various processing systems to include distributed, client/server, online and others. Perform project cost estimates using various techniques. Schedule projects using both GANTT and PERT charts. Perform coding for the project. Documentation requirements and prepare and evaluate systems documentation. Perform various systems testing techniques/strategies to include the phases of testing. Systems implementation and its key problems. Generate various reports. Be able to prepare and evaluate a final report. Brief the maintenance procedures and the role of configuration management in operations. To decide the future scope and further enhancement of the system. Plan for several appendices to be placed in support with the project report documentation. Decide the various processing systems to include distributed, client/server, online and others. Perform project cost estimates using various techniques. Schedule projects using both GANTT and PERT charts. Perform coding for the project. Documentation requirements and prepare and evaluate systems documentation. Perform various systems testing techniques/strategies to include the phases of testing. Systems implementation and its key problems. Generate various reports. Be able to prepare and evaluate a final report. Brief the maintenance procedures and the role of configuration management in operations. To decide the future scope and further enhancement of the system.

Plan for several appendices to be placed in support with the project report documentation.

- Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.
- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
- Develop of the ability to assess the implications of work performed.
- Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles
- Develop of 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 listedwoleb . 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	.Not Tochnelegios,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Pythen
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, Raspworry Pi, Arduine, 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 Organisation 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 all 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 detail 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 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 systematical 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 modification 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 screen shots. 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 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), 989-1007. 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, Joseph,S. Valacich; Pearson Education; Third Edition; 2002.
2. ISO/IEC 12207: Software Life Cycle Process
(http://www.software.org/quagmire/descriptions/iso-iec12207.asp).
3. IEEE 1063: Software User Documentation (http://ieeexplore.ieee.org).
4. ISO/IEC: 18019: Guidelines for the Design and Preparation of User Documentation for Application Software.
5. http://www.sce.carleton.ca/squall.
6. http://en.tldp.org/HOWTO/Software-Release-Practice-HOWTO/documentation.html.
7. http://www.sei.cmu.edu/cmm/

PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be summarily rejected.)

PNR **No.: .....** ne Rell**: _____**

1. Name of the Student

   _____

2. Title of the Project

   _____

3. Name of the Guide

   _____

4. Teaching experience of the Guide _____

5. Is this your first submission? Yes ☐ No ☐

Signature of the Student Signature of the Guide

Date: ..... Date: .....

Signature of the reerdinater

Date: .....

(All the text in the report should be in times new roman)

TITLE OF THE PROJECT (NOT EXCEEDING 2 LINES, 24 BOLD, ALL CAPS)

A Project Report (12 Bold)
Submitted in partial fulfillment of the
Requirements for the award of the Degree of (size-12)

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)(14 BOLD, CAPS)

By(12 Bold)

Name of The Student (size-15, title case)
Seat Number (size-15)

Under the esteemed guidance of (13 bold)

Mr./Mrs. Name of The Guide (15 bold, title case)
Designation (14 Bold, title case)

COLLEGE LOGO

DEPARTMENT OF INFORMATION TECHNOLOGY(12 BOLD, CAPS)
COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (12, Title case, bold, italic)
CITY, PIN CODE(12 bold, CAPS)
MAHARASHTRA (12 bold, CAPS)
YEAR (12 bold)

COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (13, bold, italic)
CITY-MAHARASHTRA-PINCODE(13 bold, CAPS)

DEPARTMENT OF INFORMATION TECHNOLOGY (14 BOLD, CAPS)

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, **"Title of The Project "**, is bonafied work of **NAME OF THE STUDENT** bearing Seat.No: (**NUMBER**) submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai. (12, times new roman, justified)

Internal Guide (12 bold) **Coordinator**

(Don't write names of lecturers or HOD)

External Examiner

Date: **College Seal**

COMPANY CERTIFICATE (if applicable)

(Project Abstract page format)

Abstract (20bold, caps, centered)

Content (12, justified)

Note: Entire document should be with 1.5 line spacing and all paragraphs should start with 1 tab space.

ACKNOWLEDGEMENT

(20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, justified.

(Declaration page format)

DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, "**Title of the Project**" done at **place where the project is done**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

Name and Signature of the Student

TABLE OF CONTENTS (20bold, caps, centered)

Should be generated automatically using word processing software.

List of Tables (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

List of Figures (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

(Project Introduction page format)

Chapter 1

Introduction (20 Bold, centered)

Content or text (12, justified)

Note: Introduction has to cover brief description of the project with minimum 4 pages.

Chapter 2

System Analysis (20 bold, Centered)

Subheadings are as shown below with following format (16 bold, CAPS)

2.1 Existing System (16 Bold)

2.1.1 ---------- (14 bold, title case)

2.1.1.1 ---------- (12 bold, title case)

2.2 Proposed System

2.3 Requirement Analysis

2.4 Hardware Requirements

2.5 Software Requirements

2.6 Justification of Platform (how h/w & s/w satisfying the project)

Table 2.1: Caption

Chapter 3

System Design (20 bold, centered)

Subheadings are as shown below with following format (16 bold, CAPS)
Specify figures as Fig 11.1 – caption

3.1 Module Division
3.2 Data Dictionary
3.3 E-R Diagrams
3.4 Data Flow Diagrams / UML

Note: write brief description at the bottom of all diagrams

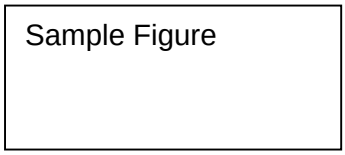

Fig. 3.1: Caption

Chapter 4

Implementation and Testing (20 bold, centered)

4.1Code (Place Core segments)

Content includes description about coding phase in your project (Font-12)

(* don't include complete code-----just description)

4.2Testing Approach

Subheadings are as shown below with following format (16 bold, CAPS)

4.2.1 Unit Testing

4.2.2 Integration Testing

Note:

- Explain about above testing methods
- Explain how the above techniques are applied in your project

Provide Test plans, test cases, etc relevant to your project

Chapter 5

Results and Discussions (20 bold, centered)

Note: Place Screen Shots and write the functionality of each screen at the bottom

Chapter 6

Conclusion and Future Work (20 bold, centered)

The conclusions can be summarized in a fairly short chapter around 300 words. A lso include limitations of your system and future scope (12, justified)

Chapter 7

References (20 bold, centered)

Content (12, LEFT)

[1] Title of the book, Author

[2] Full URL of online references

[3] ----------

* NOTE ABOUT PROJECT VIVA VOCE:

Student may be asked to write code for problem during VIVA to demonstrate his coding capabilities and he/she may be asked to write any segment of coding used in the in the project. The project can be done in group of at most four students. However, the length and depth of the project should be justified for the projects done in group. A big project can be modularised and different modules can be assigned as separate project to different students.

Marks Distribution:

Semester V: 50 Marks Documentation: 50 marks **Semester VI: 150 Marks** Documentation: 50 Marks:

Implementation and Viva Voce: 100 Marks

The plagiarism should be maintained as per the UGC guidelines.