Mahatma Education Society's

Pillai College of Arts, Commerce & Science (Autonomous)

Affiliated to University of Mumbai

'NAAC Accredited 'A' grade (3 cycles)'
'Best College Award' by University of Mumbai
ISO 9001:2015 Certified

SYLLABUS

Program: Bachelors of Science (B. Sc.) in Information Technology

T.Y.B.Sc.Information Technology

PCACS/BSCIT/SYL/2024-25/TY

As per National Education Policy
Choice Based Credit & Grading System
Academic Year 2024-25

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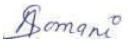
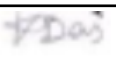
5th April, 2024

Board of Studies in the Department of Information Technology

Sr. No.	Name of the	Details	Sign
1	Prof. Deepika Sharma	Chairperson (Head of Department of Information Technology & Computer Science), Vice Principal	
2	Dr. Gajanan Wader	Principal	
3	Mrs.Munawira Kotyad Founder and CEO Wonderwheel Enterprises, Pillai, Director Pillai Center for Innovation & Research	Faculty Specialization	Absent
4	Dr. Amiya Kumar Tripathy Director Center for GeoAI & ML, Professor, Computer Engineering, Don Bosco Institute of Technology, Mumbai	Subject Expert From Outside Parent University	
5	Dr.Mrs. Anjali Kulkarni CKT College, New Panvel	Vice Chancellor Nominee, University of Mumbai	
6	Mr. Tito Idicula, Director, Programming Hub	Alumni representative	
7	Mr. Anant Baddi, Security Solution Architect, cloud Google Google	Industry Representative (Industry/Corporate/Allied Sector)	Absent

8	Mr. Bhupendra Kesariya Professor,N. M. .College, Vile Parle	Subject Expert in Mathematics From Outside Parent University	
9	Mrs. Anju Somani	Faculty Specialization	
10	Mrs. Shubhangi Pawar	Faculty Specialization	
11	Dr. Kumudini Das	Faculty Specialization	
12	Mrs. Soly Zachariah	Faculty Specialization	
13	Mrs. Ramya S. Kumar	Faculty Specialization	
14	Mrs. Sujata Shahabade	Faculty Specialization	
15	Mrs. Sreevidya T.V.	Faculty Specialization	
16	Mr. Omkar Sherkhane	Faculty Specialization	
17	Mr. Abhijeet Salvi	Faculty Specialization	

1. INTRODUCTION TO BACHELORS IN INFORMATION TECHNOLOGY (I.T.) PROGRAM

B.Sc. in Information Technology is a three years undergraduate programme that has been designed meticulously to meet the requirements of dynamic I.T. industry. This programme aims at fostering concepts of Information technology in students and equip them with the required technical, logical, problem solving and soft skills, which prepare them for the corporate world. It also focuses on inculcating effective communication skills which a software professional must have.No education is complete without incorporating social and moral values. This programme takes care of this aspect as well. The core courses of the program are supplemented by electives so that students can tailor the program according to their interest. State of art computer laboratories, in the campus, help students to practically implement the concepts learned. Qualified and experienced faculty members guide students in their project work. As we all know degrees in I.T. lead to rewarding and lucrative careers, excellent placement and incubation assistance is provided.

2. Program outcomes

Sr No	PO Title	POs in brief
PO1	**Core Knowledge**	Develop a strong foundation in the core principles and theories of their chosen field of study to pursue a profession of choice by understanding fundamental concepts, methodologies, and key terminologies
PO2	**Research Skills**	Trigger the research aptitude by developing basic research skills, including the ability to conduct literature reviews, design experiments, collect and analyze data, and draw meaningful conclusions.
PO3	**Communication Skills**	Communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing and also ability to present their work through written, oral, and visual presentations, including an original research proposal in a clear and understandable manner to both technical and non-technical audiences.
PO4	**Ethical and Professional Behavior**	Understand and adhere to ethical standards by recognizing the importance of integrity, honesty and ethical responsibility in scientific research and professional practice.
PO5	**Teamwork and Collaboration**	Ability to work cohesively to achieve common goals, solve problems and contribute to the success of a project or task paving way to individual and collective growth.
PO6	**Adaptability and Lifelong Learning**	Engage themselves in lifelong learning to keep up with the pace of changing technology and interdisciplinary approach to provide better solutions and new ideas for the sustainable developments
PO7	**Technical Skills**	Acquisition of specialized technical skills and expertise relevant to the specific field of study i.e advanced laboratory techniques, computational skills, or other specialized methodologies.
PO8	**Critical Thinking and Problem-Solving Skills**	Graduates would be equipped with the ability to analyze information critically, think logically, and solve complex problems. Applying scientific methods, mathematical reasoning, and logical approaches to real-world situations.

Program Specific Outcomes

Sr No	PSOs in brief
PSO1	Possess skill sets in information management, networking, web designing, mobile app development, Database management, programming and testing.
PSO2	Effectively integrate I.T. based solution in the users domain after properly analyzing the requirements and the constraints.
PSO3	Develop an ability to use appropriate techniques, skills and tools required for computing problems
PSO4	Ability to comprehend and write effective project reports in a multidisciplinary environment in the context of changing technologies.

Semester V						
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures /Week**
PUSIT501	Core	Enterprise Java	Theory	100	2	4
PUSIT502	Core	Software Project Management	Theory	100	2	4
PUSIT503	Core	Advance Web Programming	Theory	100	2	4
Elective Track I (Select any one)						
PUSIT504 (a)	Discipline specific Elective	Design Thinking for Innovation & Visual design	Theory	100	2	4
Elective Track II (Select any one)						
PUSIT504(b)	Discipline specific Elective	Introduction to Artificial Intelligence	Theory	100	2	4
PUSIT505	Skill Enhancement	Internet of Things	Theory	100	2	2
PUSIT506	ValueBased	Emotional Intelligence	Theory	50	2	2
PUSIT 504P	Discipline specific Elective	Design thinking for innovation & Visual Design practical / Introduction to Artificial Practical	Practical	50	2	2
PUSIT505P	Skill Enhancement	Internet of Things Practical	Practical	50	2	2
PUSIT507P	Skill Enhancement	Enterprise Java Practical+Advanced Web Programming Practical	Practical	50	2	2
PUSIT508	Skill Enhancement	Project Dissertation	Practical	50	2	2
Total				**750**	**20**	
All Subjects having Field Project as part of Continuous Assessment-2						

Semester VI						
Course Code	**Course Type**	**Course Title**	**Theory/ Practical**	**Marks**	**Credits**	**Lectures /Week**
PUSIT601	Core	Linux Administration	Theory	100	2	4
PUSIT602	Core	Information & Network Security	Theory	100	2	4
PUSIT603	Core	Software Testing	Theory	100	2	4
Elective Track I (Select any one)						
PUSIT604 (a)	Discipline specific Elective	Digital Marketing	Theory	100	2	4
Elective Track II (Select any one)						
PUSIT604(b)	Discipline specific Elective	Machine Learning	Theory	100	2	4
PUSIT605	Skill Enhancement	Business Intelligence	Theory	100	2	2
PUSIT601P	Core	Linux Administration Practical/Enterprise Networking Practical	Practical	50	2	2
PUSIT602P	Discipline specific Elective	Information & Network Security Practical/Security in Computing Practical	Practical	50	2	2
PUSIT604P	Skill Enhancement	Digital Marketing Practical/Machine Learning Practical	Practical	50	2	2
PUSIT605P	Skill Enhancement	Business Intelligence / Cyber Forensics practical	Practical	50	2	2
PUSIT606	Skill Enhancement	Project Implementation	Practical	150	2	2
Total				**850**	**20**	
All Subjects having Field Project as part of Continuous Assessment-2						

Evaluation Pattern

Marking Code	Marking Scheme
A	60 Marks Final Exam, 20 Marks Internal Exam, 20 Marks Project.
B	60 Marks Final Exam, 40 Marks Internal Exam.
C	100 marks distributed within report /case study/ project/ presentation etc.
D	50 Marks Practical Examination.(10 marks viva,10 marks Journal,30 marks Program Executions)

SEMESTER V

Course Code	Course Type	Course Title	Evaluation Pattern
PUSIT501	Core	Enterprise Java	A
PUSIT502	Core	Software Project Management	A
PUSIT503	Core	Advance Web Programming	A
PUSIT504 (a)	Discipline specific Elective	Design Thinking for Innovation & Visual design	A
PUSIT504(b)	Discipline specific Elective	Introduction to Artificial Intelligence	A
PUSIT505	Skill Enhancement	Internet of Things	A
PUSIT506	Value Based	Emotional Intelligence	C
PUSIT 504P	Discipline specific Elective	Design thinking for innovation & Visual Design practical / Introduction to Artificial Practical	D
PUSIT505P	Skill Enhancement	Internet of Things Practical	D
PUSIT507P	Skill Enhancement	Enterprise Java Practical+Advanced Web Programming Practical	D
PUSIT508	Skill Enhancement	Project Dissertation	C

SEMESTER VI

Course Code	Course Type	Course Title	Evaluation Pattern
PUSIT601	Core	Linux Administration	A
PUSIT602	Core	Information & Network Security	A
PUSIT603	Core	Software Testing	A
PUSIT604 (a)	Discipline specific Elective	Digital Marketing	A
PUSIT604(b)	Discipline specific Elective	Machine Learning	A
PUSIT605	Skill Enhancement	Business Intelligence	A
PUSIT601P	Core	Linux Administration Practical/Enterprise Networking Practical	D
PUSIT602P	Discipline specific Elective	Information & Network Security Practical/Security in Computing Practical	D
PUSIT604P	Skill Enhancement	Digital Marketing Practical/Machine Learning Practical	D
PUSIT605P	Skill Enhancement	Business Intelligence / Cyber Forensics practical	D
PUSIT606	Skill Enhancement	Project Implementation	C

SEMESTER V

BOS	**Computer Science**
Class	**T.Y.B.Sc.I.T.**
Semester	**V**
Subject Name	**Enterprise Java**
Subject Code	**PUSIT501**
Level of the Subject	**Advanced**

Course Objectives:

1. The objective of this course is to teach the learner how to use Enterprise Java.
2. To develop code and understand the concepts of Enterprise Java and to over-up with the pre-requisites of Enterprise Java.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	**Understanding ng Java EE & Servlet Technology with JDBC**	**1.1**	**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.	**10**
		1.2	**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.	
		1.3	**Request Dispatcher:** Request dispatcher Interface, Methods of Request dispatcher, Request dispatcher 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	
		1.4	**Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, Statement , PreparedStatement, CallableStatement , ResultSet, ResultSetMetaData etc. The Servlet GUI and Database Example.	

2	**JSP & JSTL Libraries**	**2.1**	**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? About Java Server Pages Getting Started With Java Server Pages: Comments, JSP Document, JSP Elements, JSP GUI Example.	**10**
		2.2	**Action Elements:** Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Java bean. **Directives of JSP :** page , include & taglib.	
		2.3	**Implicit Objects, Scope and El Expressions:** Implicit Objects, Character Quoting Conventions, Unified Expression Language[Unified El], Expression Language.	
		2.4	**Java Server Pages Standard Tag Libraries:** What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Introduction to Tag Libraries.	
3	**EJB, Interceptors & JNDI**	**3.1**	**Introduction To Enterprise Java beans:** Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans	**10**
		3.2	**Working with Session Beans:** When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Life cycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.	
		3.3	**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, Around Invoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.	
		3.4	**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, Data source Resource Definition in Java EE.	

4	**Persistence, ORM, JPA & Hibernate**	**4.1**	**Persistence, Object/Relational Mapping And JPA:** What is Persistence? Persistence in Java, Current Persistence Standards in Java, why another Persistence Standards? Object/Relational Mapping, **Introduction to Java Persistence API:** The Java Persistence, API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications	**10**
		4.2	**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 Java bean Class, Creating Persistence Unit [Persistence.xml], Creating JSPS, The JPA Application Structure, Running the JPA Application	
		4.3	**Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?	
		4.4	**Writing Hibernate Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in MySQL, creating Web Application, Adding the Required Library Files, creating a Java bean Class, Creating Hibernate Configuration File, adding a Mapping Class, Creating JSPS, Running the Hibernate Application.	
Total No. of Lectures				**40**

Course Outcomes:

CO1 : Good Knowledge of understanding the Java Enterprise Edition & JDBC.
CO2 : Illustrate the concept of Servlet Technology.
CO3 : Identity directives, actions & implicit objects of a JSP & determine the concept of Expression Language & Java Standard Library.
CO4 : Distinguish between different types of Enterprise Java Bean and also develop application by using Interceptors & JNDI.
CO5 : Evaluate the role of JPA with ORM.
CO6 : Develop an application to demonstrate the concept of JPA or Hibernate.

References:

1. 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

4. Horstmann, C.S. (2018). Core Java Volume I--Fundamentals (11th ed.). Pearson.
5. Bloch, J. (2018). Effective Java (3rd ed.). Addison-Wesley Professional.

CASE STUDY	
1	**Case Study: XYZ Corporation's Inventory Management System** **Background:** XYZ Corporation is a leading retail company with multiple stores across different cities. They specialize in selling electronic gadgets, home appliances, and accessories. To streamline their operations, they have decided to develop an Inventory Management System (IMS) using Java Enterprise technologies. **Problem Statement:** XYZ Corporation wants to build an IMS that can handle the following functionalities: **Product Management:** The system should allow adding new products, updating existing product details, and deleting products. Each product has attributes such as name, description, price, and quantity in stock. **Order Processing:** Customers can place orders for products. The system should track order details, including customer information, ordered products, and order status (e.g., pending, shipped, delivered). **Inventory Tracking:** The IMS should maintain real-time inventory levels. When an order is placed, the system should update the stock quantity accordingly. **Reporting and Analytics:** Generate reports on top-selling products, low-stock items, and overall sales. Provide insights to help management make informed decisions.
2	**Case Study: ABC Bank's Online Banking System** **Background:** ABC Bank is a prominent financial institution with a large customer base. They want to enhance their services by developing a robust **Online Banking System** using Java Enterprise technologies. The system should allow customers to perform various banking operations securely. **Problem Statement:** ABC Bank's Online Banking System needs to address the following requirements: 1. **User Authentication and Authorization:** o Implement secure user authentication using username and password. o Define roles (e.g., customer, manager, admin) and restrict access based on roles. 2. **Account Management:** o Customers can open new accounts (e.g., savings, checking). o Allow account holders to view balances, transfer funds, and update account details. 3. **Transaction Processing:** o Handle fund transfers between accounts. o Ensure transaction consistency and integrity. 4. **Security Measures:** o Implement encryption for sensitive data (e.g., passwords, account numbers). o Prevent common security vulnerabilities (e.g., SQL injection, cross-site scripting).

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Subject Name	**Enterprise Java Practical**
Subject Code	**PUSIT507P**
Level of the Subject	**Advanced**

Practical No.	**Details**
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.
2.	Implement the following Servlet applications with Cookies and Sessions. a. Using RequestDispatcher 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.
3.	Implement the Servlet IO and File applications. a. Create a Servlet application to upload and download a file. b. Develop a Simple Servlet Question Answer Application using Database. c. Create a simple Servlet application to demonstrate Non-Blocking Read Operation.

4.	Implement the following JSP applications. a. Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types. b. 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). c. Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
5.	Implement the following JSP JSTL and EL Applications. 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 application which works with Interceptors & JNDI.
7.	Implement the following EJB applications with different types of Beans. a. Develop a simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans b. Develop simple Marks Entry Application to demonstrate accessing Database using EJB
8.	Implement the following JPA applications. a. Develop a simple Inventory Application Using JPA b. Develop a Guestbook Application Using JPA. c. Create simple JPA application to store and retrieve Book details
9.	Implement the following JPA applications with ORM and Hibernate. a. Develop a Hibernate application to store Feedback of Website Visitors in MySQL Database. b. Develop a Hibernate application to store and retrieve employee details in MySQL Database.
10.	Implement the following Hibernate applications. a. Design a five page web application by using Hibernate to work with a database.
	Total no of Lectures: 20

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Software Project Management**
Course Code	**PUSIT502**
Type of course	**Core**
Level of the Subject	**Advanced**
Credit points	**2**

Course Objectives:

1. Articulate the purpose and benefits of project management.
2. To get acquainted with the recent developments in the field of Project Management.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	Introduction to Software Project Management	1.1	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.	10

2	Selection of Project Approach and Effort Estimation	2.1	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,Rapid Application Development, Agile Methods, Managing Iterative Processes, Selecting the Most Appropriate Process Model.	10
		2.2	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 Judgment, Estimating by Analogy, Albrecht Function Point 5 Analysis, Function Points Mark II, COSMIC Full Function Point	
		2.3	COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	
3	Risk Management and Resource Allocation	3.1	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.	10
		3.2	Risk Management: Introduction, Risk, Categories of Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm‟s Top 10 Risks and Countermeasures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.	

		3.3	Resource Allocation: Introduction, Nature of Resources,Identifying Resource Requirements,Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule,CostSchedules,Scheduling Sequence	
4	Monitoring and Control and Emerging Trends in Software Project Management		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).	10
			Project Close-out and Termination : Introduction, Elements of Project Closeout Management, Lessons learned meetings, Closeout Paperwork, Why are Closeouts difficult?, Dynamic Project Factors, Signs of Project Failure, Project Termination issuesFinal Report elements.	
			Project Management Softwares: Introduction, Common features of Project Management Softwares, Latest SPM tools.	
	Total No. of Lectures			**40**

Course Outcomes:

1. Describe the concept of Project planning, monitoring , control and responsibilities of a Project Manager.
2. Discuss the emerging trends in SPM.
3. Illustrate cost benefit analysis technique, cost estimation, project scheduling and risk management.
4. Analyzing the project progress.
5. Evaluate various parameters to select the best Software Development Model/methodology for a given project.
6. Create an Activity Plan for a given project.

References :

1. Software Project Management; Bob Hughes, Mike Cotterell, Rajib Mall; TMH 6th edition; 2018
2. Project Management and Tools & Technologies – An overview; Shailesh Mehta; SPD; 1st edition; 2017
3. Software Project Management; Walker Royce; Pearson ; 2005
4. A Guide to the Project Management Body of Knowledge: PMBOK® Guide (Sixth Edition)

5. “The Software Development Project: Planning and Management” by Phillip Bruce and Sam M Pederson

e-Books :

1. https://www.knowledgetrain.co.uk/res/ebooks/what-is-devops-ebook.pdf
2. https://drive.google.com/file/d/1tCP2GUy_GlXy_0Y412hgd3TSAaeShmU5/vie w?usp=sharing

CASE STUDY	
1)	A software firm adopts Agile methodology for a new project, ensuring flexibility and alignment with client needs. By employing bottom-up estimating and COCOMO II model, they accurately allocate resources. Proactive risk management, utilizing PERT analysis and Monte Carlo simulation, helps mitigate potential setbacks. With robust monitoring and control mechanisms like Earned Value Analysis, they ensure project success, delivering on time and within budget.
2)	Facing a complex software project, a development team adopts the Spiral model, prioritizing iterative development and risk management. Effort estimation relies on COCOMO II and function point analysis to allocate resources effectively. Risk management techniques, including risk identification and Monte Carlo simulation, ensure proactive mitigation strategies. Through diligent monitoring and control, utilizing Earned Value Analysis and change control processes, the team navigates challenges, delivering a successful project on schedule.

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Advanced Web Programming**
Course Code	**PUSIT503**
Type of course	**Core**
Level of the Subject	**Advanced**
Credit Points	**2**

Course Objectives:

1. To provide insight into .NET technologies for web programming and enable them to design and develop interactive and responsive web applications.
2.. To learn Connectivity with Database using ADO.Net.

Unit No.	**Name of Unit**	**Topic No.**	**Content**	**Hours**
1	The .NET Framework	1.1	The .NET Framework**:** .NET Languages, Common Language Runtime, .NET Class Library	10
		1.2	The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Exception Handling.	
		1.3	Types, Objects, and Namespaces: The Basics About Classes, building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	
2	ASP. NET Web Controls	2.1	Web Form Fundamentals: Introducing Server Controls, Using the Page Class, Using Application Events,	10
		2.2	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,	

		2.3	Rich Controls, The Calendar, The Ad Rotator, Pages with Multiple Views, User Controls, Website Navigation: Site Maps, The Sitemap Path Control, The Tree View Control, The Menu Control.	
3	Master Pages and state management and ADO.NET Data Controls	3.1	Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages	10
		3.2	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	
		3.3	ADO.NET Fundamentals: Understanding Databases, Congaing our Database, Understanding SQL Basics, Using Direct Data Access, Using Disconnected Data Access. The Data Controls: The Grid View, Formatting the Grid View, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, The DetailsView and FormView	
4	Intro to AngularJS	4.1	Need of AngularJS in real web sites, Downloading AngularJS, AngularJS first example,AngularJS built-in directives, AngularJS expressions, AngularJS modules,	10
		4.2	AngularJS controllers, AngularJS scope AngularJS dependency injection AngularJS, bootstrapping AngularJS data bindings, AngularJS filters, AngularJS events,	
		4.3	AngularJS AJAX, Ng-repeat, AngularJS with json arrays, AngularJS registration form and login form, AngularJS CRUD operations, AngularJS Animations, AngularJS validations	
		4.4	Understanding .NET Core, .NET Core Features, .NET Core Framework Architecture, .NET Core Supports, Advantages of .NET Core, .NET App Model Understanding ASP.NET Core. .NET CLI and Visual Studio Project Templates –Introduction to .NET CLI, .NET CLI Commands, Creating an ASP.NET Core project, Understanding ASP.NET Core project folder structure, Understanding configuration files.	
			Total No. of Lectures	**40**

Course Outcomes:

1. Identify the features of .net framework along with the feature of c#.
2. Implement various controls and navigation techniques for integrating web pages within the site.
3. Apply master pages and state management techniques for web pages.
4. Develop crud applications using sql server database.
5 Understand the fundamentals of Angular Forms and its controls
6. Develop crud applications using AngularJS,

References:

1. Beginning ASP.NET 4.5 in C#Matthew MacDonald, Apress(2012)
2. The Complete Reference ASP .NET, MacDonald, Tata McGraw Hill
3. Building Web Solutions with ASP.NET and ADO.NET, Wintellect
4. ASP.NET 4.0 Programming, J.Kanjilal, Tata McGraw Hill(2011)
5. https://www.w3schools.com/angular/

CASE STUDY	
1)	Building an Employee Management System XYZ Corporation needed an Employee Management System (EMS) using ASP.NET with C#. Their requirements included user authentication, a master page for layout consistency, employee data entry with validation controls, web server controls for data input, ADO.NET for database connectivity, role-based security, and CSS styling for aesthetics. By following these guidelines, ABC Corporation successfully developed an EMS that tracks employee information securely and provides an appealing user interface.
2)	Webtech Corporation plans to develop a web-based Employee Management System (EMS) utilizing web server controls like TextBoxes, Labels, and Buttons for data input, display, and actions. Rich controls such as GridView for employee lists and a DropDownList for department selection will be employed. Validation controls like RequiredFieldValidator and CustomValidator will ensure data accuracy, while a Menu and SiteMapDataSource will enhance navigation. The EMS aims to streamline employee record management, offer a user-friendly interface, and improve HR department efficiency and data reliability at XYZ Corporation.

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Advanced Web Programming Practical**
Course Code	**PUSIT 507P**
Type of course	**Core**
Level of the Subject	**Advanced**
Credit points	**2**

Practical No.	**Details**
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. Programs to create and use DLL 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 the sum of digits of a number
2.	Create a simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces v. Using Delegates and events vi. Exception handling
3.	Create a simple web page with various server controls to demonstrate setting and use of their properties. (Example: AutoPostBack) b. Demonstrate the use of Calendar control to perform following operations. i. Display messages in a calendar control ii. Display vacation in a calendar control iii. Selected day in a calendar control using style
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 Ad rotator Control c. Create Web Form to demonstrate use of 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 the use of Master Page with applying Styles and Themes for page beautification. c. Create a web application to demonstrate various states of ASP.NET Pages.
6.	Working with Database (Connected Data Access) Write a web application to perform CRUD operation.
7.	Create a web application to display Using Disconnected Data Access and Data Binding using Grid View.
8.	Working with GridView control Create a web application to demonstrate use of GridView button column and GridView events. b. Create a web application to demonstrate GridView paging and Create your own table format using GridView.
9.	a. Write a program to demonstrate the concept of directives in AngularJS. b. Write a program for registration form and login form using AngularJS.
10.	a. Write a program to perform CRUD operations on databases using AngularJS.
	Total no of Lectures:20

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Design Thinking for Innovations & Visual design**
Course Code	**PUSIT504(a)**
Level of Subject	**Medium**

Course Objectives:

1. To understand the concepts of Design Thinking and its applications in the real world.
2. To get well-versed with visual design best practices.

Unit No	Name of the Unit	Topic No.	Content	Hours
1	Introduction to design thinking	1.1	What is design, Need of Design, History, What is design thinking, Applications, Business Model Innovation, Challenges Best-suited for design thinking, Importance of Innovation	10
		1.2	What is design Innovation, Human – centered design, Translating insights into innovative opportunities, Human centered design in the real world.	
2	Innovation & Creative thinking	2.1	The Physics of Innovation, Story Telling, How prepared is your mind for innovation. Levels of creativity, Creativity Tools, How to reach users through stories.	10
		2.2	The idea generation process, 10 design thinking tools, Brainstorming, Brainstorming Techniques, The principle of Brainstorming, Alphabet Brainstorming, Brainwriting, Grid Brainstorming.	
3	Introduction to mock-ups & Hierarchy	3.1	Introduction to mock-ups, transitions from low-fidelity to high-fidelity designs, Introduction to foundational elements of visual design, Importance of typography, grids to guide layouts	10
		3.2	Emphasis & Hierarchy in UX design, Give & receive feedback as a UX designer, The basics of design critique sessions, Best practices for critique sessions, Introduction to mock crit session, observe a mock crit, Turn crit session feedback into actions, Iterate on mock-ups based on feedback from crit sessions	

4	Visual design elements	4.1	Types of Icons, Anatomy of Icons, Logo design, Types of logo design, Features of an effective logo, Importance.	10L
		4.2	UI animation, What is UI animation, Animation vs. Motion graphics, Why UI animation important, Different kinds of UI animations, principles, tools, What are illustrations and its Importance.	
Total No. of Lectures				**40**

Course Outcomes:

1. Understand basics of Design, Design Thinking and the approaches used in it as well as Design Innovation.
2. Analyze the concept of Model Innovation and the challenges faced in selection of best strategy.
3. Study the Art of Story-telling and how it can be used effectively to reach Users through stories.
4. Gain Knowledge of the workaround behind Idea generation and principles of Brainstorming.
5. Evaluate the responsibilities of a good UX Designer and basics of design critiques.
6. Implement the impact of Animations and illustrations in Design & importance of Logo making and how do you curate an effective logo.

References:

1.Book on Design Thinking for Beginners: Innovation as a factor for entrepreneurial success.
2.Design Thinking by Nigel Cross
3.Thinking with Type, by Ellen Lupton
4. Norman, D.A. (2013). The Design of Everyday Things: Revised and Expanded Edition. Basic Books.
5. Tognazzini, B., & Nielsen, J. (2001). Tog on Interface. Addison-Wesley Professional.
6. Buxton, B. (2007). Sketching User Experiences: Getting the Design Right and the Right Design. Morgan Kaufmann.

CASE STUDY	
1)	Netflix is one of the prime design thinking examples. It used the approach to determine what its customers wanted and needed and later changed its business model to meet those needs. Customers were looking for more interesting content. It was faced with competition as movies and sitcoms were easily available on other platforms as well. Netflix used the design thinking approach to develop new ideas. It kept testing and experimenting. Netflix knew they needed more to lure customers.Netflix started giving DVD subscriptions. It was tested and experimented on for ten years. People were made comfortable with streaming videos. It took over the market as broadband and internet services began to grow.
2)	Pill Pack is one of the best design thinking process examples. It is an online pharmacy that delivers medicine and prescription drugs.How to make it easy for people to order medicines online and be a trustworthy platform.Pillpack chose to work with designers and used a human-centered approach to refine its brand vision and strategy.The company followed a design thinking process while making its brand strategy and overall design. In 2014, Time Magazine labeled Pillpack the year's best invention. Moreover, it was acquired by Amazon for $1 billion in 2018.

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Design Thinking for Innovations & Visual design Practical**
Course Code	**PUSIT504(a)P**
Level of Subject	**Medium**

Practical No.	Details
1	Design Mockup for given project.
2	Create Low-fidelity to high fidelity designs.
3	Include Navigation in your mock-ups.
4	Apply Gestalt principles to your projects
5	Create grids in your portfolio project mockups
6	Create a sticker sheet for your portfolio projects
7	Test your Knowledge on implementing feedback from crit session, Request feedback on your work
8	Design all types of logo
9	Design illustrations
10	Create basic Animation using Figma.
Total No of Lectures:20	

BOS	**Computer Science**
Class	**T.Y.B.Sc. IT**
Semester	**V**
Course Name	**Artificial Intelligence**
Course Code	**PUSIT504 (b)**
Type of course	**Basic**
Level of the Subject	**Advanced**

Course Objectives:
1. To explore the applied branches of artificial intelligence .
2. To enable the student to solve the problem aligned with derived branches of artificial intelligence.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	An Introduction to AI & Expert System	1.1	Artificial Intelligence : Role of AI in engineering, AI in daily life, Intelligence and Artificial Intelligence, Different task domains of AI, Programming methods, Limitations of AI	10
		1.2	Expert System and Applications: Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools	
2	Introduction to Soft Computing, Fuzzy Logic & Defuzzification	2.1	Importance of soft computing; Soft computing versus hard computing; Supervised and unsupervised learning; Introduction to main components of soft computing: Fuzzy logic, Neural networks, Genetic algorithms	10

		2.2	Fuzzy Sets and Fuzzy Logic: Fuzzy Sets, Fuzzy set operations, Types of Membership Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic	
3	Neural Network, Genetic Algorithm & ANN	3.1	Basic concepts of Neural network; Overview of learning rules and parameters; Activation functions; Single layer perceptron and multilayer perceptron.	10
		3.2	Basic concepts Genetic Algorithms : What is Genetic Algorithm, Difference between traditional algorithms and Genetic Algorithm (GA); Basic concepts of GA; GA Operators: Reproduction, Crossover, Mutation; Convergence of GA.	
		3.3	Artificial Neural Network: Introduction, Fundamental Concept, Artificial Neural Network, Brain vs. Computer - Comparison Between Biological Neuron and Artificial Neuron, Basic Models of Artificial Neural Network	
4	Intelligent Agents and Artificial Intelligence on the Cloud	4.1	Intelligent Agents: Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications	10
		4.2	Artificial Intelligence on the Cloud Why are companies migrating to the cloud? The top cloud providers Amazon Web Services: Amazon SageMaker Microsoft Azure: Machine Learning Studio	
Total No. of Lectures				**40**

Course Outcomes:

1. Discuss in detail different domains where AI is used.
2. Understand the fundamentals concepts of the expert system and its applications.
3. Analyze the concept of fuzzy sets and Defuzzification for solving AI based problems.
4. Acquire the knowledge of the Machine Learning applications .
5. Understand applications of genetic algorithms in different problems related to artificial intelligence.
6. Elaborate and articulate the significance of Artificial Neural Networks in Artificial Intelligence.

References:

Business Intelligence: Data Mining and Optimization for

1. Decision Making, Carlo Vercellis,, Wiley, First, 2009
2. Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, Dursun Delen, Pearson, Ninth, 2011
3. Fundamental of Business Intelligence, Grossmann W, Rinderle-Ma, Springer, First 2015
4. Norman, D.A. (2013). The Design of Everyday Things: Revised and Expanded Edition. Basic Books.
5. Tognazzini, B., & Nielsen, J. (2001). Tog on Interface. Addison-Wesley Professional.

CASE STUDY	
1)	A software company has got a project to create an expert system for a gym trainer. The project manager is now supposed to choose members who will be working on this project.Once the main players/members are chosen the expert system development team is ready. Now he(project manager) is supposed to assign the task as per their(team member) role and expertise. After a few months the expert system is ready to hand it over to the customer. Customers have used the software for a few months and realized that the software is giving many solutions for a particular problem. Now he wants some modification in the software. As per to his requirement the software should give one optimal best solution for a particular problem.Can you guess who will be the main players of the development team?Elaborate on the task given to each team member.What action will be taken by the manager to overcome the problem faced by the customer. Elaborate the steps used by the project manager to provide optimal solutions.
2)	A software company has got a project to create a Rule Based expert system for Doctors. The programmer needs to create rules which can be used in the knowledge base. Once the rule is created the finalized knowledge base is ready. During the testing phase it was observed that the system is giving the same answer for two different conditions. The project manager is now supposed to apply some technique to overcome this problem.What is the generalized structure of a rule?List any 3 rules which you will incorporate in the systemCan you figure out what the system is giving the same answer for two different conditions?How will you resolve the problem faced earlier

BOS	**Computer Science**
Class	**T.Y.B.Sc. IT**

Semester	**V**
Course Name	**Artificial Intelligence Practicals**
Course Code	**PUSIT504 (b)P**
Type of course	**Basic**
Level of the Subject	**Advanced**

Practical No.	**Topic**
1	Write a program to implement Exploratory Data Analysis (EDA)& Data Pre processing (Outlier Detection, Handling Missing Data, Encoding Categorical Data) using univariate analysis and bivariate analysis
2	Write a program to Implement Expert System.
3	Write a Program in python to perform different operations on a fuzzy set.
4	Perform Feature Engineering and Feature Transformation on a dataset
5	Create Intelligent Agents with Reinforcement Learning
6	Write a program to implement of Logic gates(XOR gate) in Neural Network
7	Write a Python program to implement simple Chatbot.
8	Write a Python program to implement a Tic-Tac-Toe game.
9	Case Study on ANN
10	Case Study on Genetic Algorithm
Total No. of Lectures 20	

BOS	**Computer Science**
Class	**T.Y B.Sc I.T**
Semester	**V**
Course Name	**Internet of Things**
Course Code	**PUSIT505**
Type of course	**Core**
Level of the Subject	**Moderate**
Credit points	**2**

Course Objectives:

1. To understand the concepts of Internet of Things and Industrial Internet of Things
2. To program using Raspberry Pi and Arduino

Unit No	Name of Unit	Topic No	Content	Hours
1	Introduction to Internet of Things	1.1	Introduction to Internet of Things: Introduction, characteristics, Applications, Baseline Technologies, sensors, actuators, IoT Components and implementation, challenges for IoT	10
		1.2	Introduction to Arduino: Introduction, components of Arduino Board, Arduino IDE, Sample code.	
2	Raspberry Pi Boot and Programming Raspberry Pi	2.1	Introduction to Raspberry Pi: Introduction, Architecture, PIN Configuration, Case studies	10
		2.2	Raspberry Pi Boot: Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware.	
		2.3	Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands.Programming interfaces: Introduction to Node.js, Python.	
3	Raspberry Pi Interfaces & IoT Protocols	3.1	Raspberry Pi Interfaces: UART, GPIO, I2C, SPI, Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera	10

		3.2	Connectivity technologies: Introduction, IEEE 802.15.4, ZigBee, WiFi, 6LoWPAN, RFID, NFC, Bluetooth.	
		3.3	Internet of Things Protocols :HTTP, UPnp, CoAP, MQTT, XMPP.	
4	Cloud Computing	4.1	Introduction to Cloud Computing,Characteristics and benefits Of Cloud Computing	10
		4.2	Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing,Elements of Parallel Computing, Elements of DistributedComputing.	
		4.3	Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service	
Total No. of Lectures				**40**

Course Outcomes:

1. Describe IoT, its components and control boards
2. Demonstrate how to prepare Raspberry Pi with hardware and installation.
3. Design and program IoT devices
4. Illustrate security tools and protect the system from damage
5. Apply different Linux Commands and different programming interfaces to work with RaspberryPi
6. Understand the concepts of Cloud Computing

References:

1. Internet of Things ,Dr.Jeeva Jose,Khanna Book Publishing
2. Learning Internet of Things, Peter Waher, Packt Publishing(2015)
3. Mastering the Raspberry Pi, Warren Gay, Apress(2014)
4. Internet of Things – Architecture and Design by Raj Kamal,First Edition, McGraw Hill
5. Getting Started with the Internet of Things by Cuno Pfister,Sixth Edition, O‟Reilly

CASE STUDY	
1)	The integration of the IoT and cloud technology is very important to have a better solution for an uninterrupted, secured, seamless, and ubiquitous framework. The complementary nature of the IoT and the cloud in terms of storage, processing, accessibility, security, service sharing, and components makes the convergence suitable for many applications. The advancement of mobile technologies adds a degree of flexibility to this solution. The

	health industry is one of the venues that can benefit from IoT–Cloud technology, because of the scarcity of specialized doctors and the physical movement restrictions of patients, among other factors. In this article, as a case study, we discuss the feasibility of and propose a solution for voice pathology monitoring of people using IoT–cloud. More specifically, a voice pathology detection system is proposed inside the monitoring framework using a local binary pattern on a Mel-spectrum representation of the voice signal, and an extreme learning machine classifier to detect the pathology. The proposed monitoring framework can achieve high accuracy of detection, and it is easy to use.
2)	The United Nations estimate that by 2050 almost two thirds of the world's population will be living in urban areas, increasing the already high population density of big cities. An emerging solution to deal with this scenario is the convergence of information and communication technologies through the implementation of the concept of smart cities. This concept is based on the idea of using Internet of Things (IoT) sensors and devices to intelligently implement solutions that meet the demands generated by this expected scenario Considering this challenging scenario, the implementation of the IoT concepts becomes mandatory for smart cities, since it allows objects to connect with each other and interact with humans in a pervasive and intelligent.One of the services which is becoming important in this context is the efficient management of the waste generated in big cities. A successful IoT-based system for waste control which is currently implemented in South Korea. The main concept behind the proposal is that at the time of disposal, residents are identified by RFID cards in waste bins. The waste is weighed and the information is sent to a server that automatically processes this information for billing purposes. The current projects are mainly focused on garbage collection, not taking into account another important aspect, which is the correct waste separation considering the characteristics of the disposed products. The multilevel approach allows the integration of physical objects, communication infrastructure, cloud platform, and IoT-based services in a pervasive way, which facilitates the implementation of diverse kinds of services in the context of smart cities.

BOS	**Computer Science**
Class	**T.Y B.Sc I.T**
Semester	**V**
Course Name	**Internet of Things Practicals**
Course Code	**PUSIT505P**
Type of course	**Core**
Level of the Subject	**Moderate**
Credit points	**2**

Practical No.	Details
1	Introduction about the different components in IoT and the different control boards used to implement Iot
2	Preparing Raspberry Pi: Hardware preparation and Installation
3	Execute linux commands on Raspberry Pi
4	GPIO: Light the LED with Python
5	Show Pulse Width Modulation output on Raspberry Pi
6	Controlling Raspberry Pi with Telegram App
7	Interfacing Raspberry Pi with RFID.
8	Show how PiCamera capture the image
9	Convert Raspberry Pi as a Web Server
10	Fingerprint Sensor interfacing with Raspberry Pi
Total No.of Lectures 20	

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**V**
Course Name	**Project Dissertation**
Course Code	**PUSIT508**
Type of course	**Skill Enhancement**
Level of the Subject	**Advanced**
Credit points	**2**

Project Dissertation Semester V and Project Implementation Semester VI

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

I. OBJECTIVES

1. Describe the Systems Development Life Cycle (SDLC).
2. Evaluate systems requirements.
3. Complete a problem definition.
4. Evaluate a problem definition.
5. Determine how to collect information to determine requirements.
6. Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.

7. Work on data collection methods for fact finding.

8. Construct and evaluate data flow diagrams.

9. Construct and evaluate data dictionaries.

10. Evaluate methods of process description to include structured English, decision tables and decision trees.
11. Evaluate alternative tools for the analysis process.

12. Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
13. Decide the S/W requirement specifications and H/W requirement specifications. 14. Plan the systems design phase of the SDLC.
15. Distinguish between logical and physical design requirements. 16. Design and evaluate system outputs.
17. Design and evaluate systems inputs.

18. Design and evaluate validity checks for input data.

19. Design and evaluate user interfaces for input.

20. Design and evaluate file structures to include the use of indexes.

21. Estimate storage requirements.

22. Explain the various file update processes based on the standard file organizations.

23. Decide various data structures.

24. Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.
25. Perform normalization for the unnormalized tables for RDBMS related projects

26. Decide the various processing systems to include distributed, client/server, online and others.
27. Perform project cost estimates using various techniques.
28. Schedule projects using both GANTT and PERT charts.

29. Perform coding for the project.

30. Documentation requirements and prepare and evaluate systems documentation.

31. Perform various systems testing techniques/strategies to include the phases of testing.
32. Systems implementation and its key problems.

33. Generate various reports.

34. Be able to prepare and evaluate a final report.

35. Brief the maintenance procedures and the role of configuration management in operations.
36. To decide the future scope and further enhancement of the system.

37. Plan for several appendices to be placed in support with the project report documentation.
38. Decide the various processing systems to include distributed, client/server, online and others.
39. Perform project cost estimates using various techniques.

40. Schedule projects using both GANTT and PERT charts.

41. Perform coding for the project.

42. Documentation requirements and prepare and evaluate systems documentation.

43. Perform various systems testing techniques/strategies to include the phases of testing.
44. Systems implementation and its key problems.

45. Generate various reports.

46. Be able to prepare and evaluate a final report.
47. Brief the maintenance procedures and the role of configuration management in operations.
48. To decide the future scope and further enhancement of the system.

49. Plan for several appendices to be placed in support with the project report documentation.
50. Work effectively as an individual or as a team member to produce correct, efficient, well- organized and documented programs in a reasonable time.
51. Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
52. Develop the ability to assess the implications of work performed.
53. Get good exposure and command in one or more application areas and on the software
54. Develop quality software using the software engineering principles
55. Develop the ability to communicate effectively.

II. TYPE OF THE PROJECT

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

II. SOFTWARE AND BROAD AREAS OF APPLICATION

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,MongoDB
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), TcL/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES **UNIX INTERNALS** **NETWORK/WIRELESS TECHNOLOGIES**	COM/DCOM, Active-X, EJB Device Drivers, RPC, Threads, Socket programming -
REALTIME OPERATING SYSTEM/ EMBEDDED SKILLS	LINUX, Raspberry Pi, Arduino, 8051
APPLICATION AREAS	Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming.

INTRODUCTION

The project report should be documented with a 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:

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

CHAPTER 1: INTRODUCTION

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

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

1. Problem Definition

1. Requirements Specification
2. Planning and Scheduling
3. Software and Hardware Requirements
4. Preliminary Product Description
5. Conceptual Models

CHAPTER 4: SYSTEM DESIGN

1. Basic Modules
2. Data Design
    1. Schema Design
    2. Data Integrity and Constraints
3. Procedural Design
    1. Logic Diagrams
    2. Data Structures
    3. Algorithms Design
4. User interface design
5. Security Issues
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.

SEMESTER VI

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**VI**
Subject Name	**Linux System Administration**
Subject Code	**PUSIT601**
Level of the Subject	**Advanced**

Course Objectives:

1. To Learn basic and advanced concepts of Redhat Enterprise Linux.
2. To Learn different tasks like configurations, installations and management of Server using Linux operating system.

Unit No.	Name of Unit	Topic No.	Name of Topic	Hours
1	Administering Red Hat Enterprise Linux	1.1	Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.	10
		1.2	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	
		1.3	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.	
		1.4	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.	
2	Securing Red Hat Enterprise Linux	2.1	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	10

		2.2	Connecting to the Network**:** Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, 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, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access	
		2.3	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, Setting Default Permissions with umask, Working with Attributes.	
		2.4	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	
3	Networking Red Hat Enterprise Linux	3.1	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	10
		3.2	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.	
		3.3	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	

		3.4	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	
4	Advanced Red Hat Enterprise Linux Configuration	4.1	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 LDAP Authentication, Setting Up MySQL	10
		4.2	Introducing Bash Shell Scripting: Introduction of shell scripts, Elements of a Good Shell Script, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures – if...then...else, case, while, until, for	
		4.3	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.	
		4.4	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, Creating the 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	
Total No. of Lectures				40

Course Outcomes:

1. To gain Knowledge of RedHat Linux Enterprise in industry.
2. To understand and manage different tasks on Redhat Linux Server.
3. Manage the resources and security of a computer running Linux at a basic level.
4. Configure and manage simple TCP/IP network services on a Linux system.
5. Identify various processing environments available for users while working with LINUX file systems.
6. Ensure network performance via configuration, monitoring, tunneling and routing of traffic.

References:

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 Publication.
3. Linux Administration: A Beginner's Guide, Wale Soyinka, TMH, 5th edition.
4. Clark, J., & Clark, J. (2020). Designing Across Senses: A Multimodal Approach to Product Design. O'Reilly Media.
5. Withey, S. (2018). Cross-Platform Development with Delphi 10.2 & FireMonkey for Windows, MAC OS X (macOS) & Linux. CreateSpace Independent Publishing Platform.
6. Wharton, C., Rieman, J., Lewis, C., & Polson, P. (1994). The Cognitive Walkthrough Method: A Practitioner's Guide. Morgan Kaufmann.

CASE STUDY	
1)	A LTI company work with data center. Every data center consists of linux server. suppose you appointed as linux administrator in data center to share some file from linux server to window machine.
2)	You are the newly appointed Linux system administrator for a growing software development company that heavily relies on Red Hat Enterprise Linux servers. The company is experiencing challenges related to system performance, storage management, and network connectivity. Additionally, the need for secure user authentication and effective backup strategies is crucial for the development environment's stability and data integrity.

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**VI**
Subject Name	**Linux System Administration Practicals**
Subject Code	**PUSIT601P**
Level of the Subject	**Advanced**

Practical No.	**Details**
1.	Graphical User Interface and Command Line Interface and Processes 1. Installation of RHEL 6.X 2. Exploring the Graphical Desktop 3. The Command Line Interface 4. Managing Processes.
2.	Storage Devices and Links, Backup and Repository 1. Working with Storage Devices and Links 2. Making a Backup 3. Creating a Repository
3.	Working with RPMsm Storage and Networking 1. Using Query Options. 2. Extracting Files From RPMs 3. Configuring and Managing Storage 4. Connecting to the Network.

4.	Working with Users, Groups, and Permissions
5.	1. Firewall and Cryptographic services 2. Securing Server with iptables 3. Setting Up Cryptographic Services
6.	1. Configuring Server for File Sharing 2. Configuring NFS Server and Client 3. Configuring Samba 4. Configuring FTP
7.	DNS, DHCP and Mail Server 1. Configuring DNS 2. Configuring DHCP 3. Setting Up a Mail Server
8.	Web Server 1. Configuring Apache on Red Hat Enterprise Linux.\ 2. Writing a Script to Monitor Activity on the Apache Web Server 3. Using the select Command
9.	Shell Scripts and High-Availability Clustering 1. Writing Shell Scripts to Find Factorial Number, Palindrome Number, Palindrome String, Reverse Number, Armstrong Number, Count of Digit. 2. Configuring Booting with GRUB 3. Configuring High Availability Clustering
10.	Setting Up an Installation Server 1. Configuring Network Server as an Installation Server 2. Setting Up a TFTP and DHCP Server for PXE Boot
	Total No of Lectures:20

BOS	**Computer Science**
Class	**T. Y. B. Sc.I.T**
Semester	**VI**
Subject Name	**Information & Network Security**
Subject code	**PUSIT602**
Level of the Subject	**Moderate**

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity, to understand how to deploy encryption techniques to secure data in transit across data networks

Unit No.	Name of Unit	Topic No.	Name of Topic	Hours
1	Introduction, Classical Encryption Techniques Public-Key Cryptography and RSA:	1.1	Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms	10
		1.2	Classical Encryption Techniques**:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers	
		1.3	Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm	
2	Key Management, Message Authentication, Hash Functions: Signatures and Authentication:	2.1	Key Management: Public-Key Cryptosystems, Key Management, Diffie-Hellman Key Exchange	10
		2.2	Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes,	
		2.3	Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC Digital	
		2.4	Signatures and Authentication: Digital Signatures, Authentication Protocols, Digital Signature Standard	

3	Authentication Applications, Electronic Mail Security, IP Security	3.1	Authentication Applications**:** Kerberos, X.509 Authentication, Public-Key Infrastructure	10
		3.2	Electronic Mail Security: Pretty Good Privacy, S/MIME	
		3.3	IP Security**:** Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations	
4	Web Security, Intrusion, Firewalls	4.1	Web Security**:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction, , HTTPS, SSH	10
		4.2	Intrusion: Intruders, Intrusion Techniques, Intrusion Detection Malicious Software: Viruses and Related Threats, Virus Countermeasures, DDOS	
		4.3	Firewalls: Firewall Design Principles, Types of Firewalls	
			Total No. Of Lectures	**40**

Course Outcomes:

1. Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
2. Identify the security issues in the network and resolve it.
3. Illustrate various Public key and Private key cryptographic techniques.
4. Evaluate the authentication and hash algorithms
5. Identify & analyze particular security problems for a given application.
6. Summarize the intrusion detection and its solutions to overcome the attacks.

References:

1. Cryptography and Network Security: Principles and Practice 5th Edition, William Stallings, Pearson,2010 Additional
2. Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2013.
3. Cryptography and Network, Behrouz A Fourouzan, Debdeep Mukhopadhyay, 2 nd Edition,TMH,2011
4. Cryptography and Network Security , Behrouz A Fourouzan , 4th Edition
5. The Complete Reference: Information Security by Mark Rhodes Ousley, McGraw Hill

CASE STUDY	
1)	XYZ Corporation, a leading multinational company, has experienced significant growth in recent years, expanding its global network infrastructure to facilitate seamless communication and collaboration. However, this growth has also exposed the organization to heightened cybersecurity threats. This case study explores the challenges faced by XYZ Corporation and the implementation of a comprehensive network security strategy to safeguard sensitive data and ensure uninterrupted business operations. Background:XYZ Corporation operates in various industries, including finance, healthcare, and technology. With a vast network connecting numerous offices and remote locations, the company faced increasing risks associated with cyber threats, such as data breaches, ransomware attacks, and unauthorized access.The company handled sensitive customer data, financial transactions, and proprietary information, making it a prime target for cybercriminals seeking to exploit vulnerabilities and gain unauthorized access.
2)	**F**IN Corporation, a global enterprise, has recognized the increasing threats to its network security and the potential risks to its sensitive information. The company has decided to conduct a comprehensive review and enhancement of its network security measures to ensure the confidentiality, integrity, and availability of its critical data. FIN Corporation operates in a highly competitive industry, handling vast amounts of sensitive customer data, intellectual property, and proprietary information. Recent cybersecurity incidents across the industry have raised concerns about the company's vulnerability to cyber threats. To address these concerns, the organization has decided to undertake a thorough examination of its current network security infrastructure. Current Network Security Infrastructure:FYN Corporation currently employs a combination of firewalls, intrusion detection/prevention systems, VPNs, and antivirus solutions to safeguard its network. While these measures have been effective to some extent, the rapidly evolving nature of cyber threats necessitates a proactive approach to stay ahead of potential risks.

BOS	**Computer Science**
Class	**T. Y. B. Sc I.T**
Semester	**VI**
Subject Name	**Information & Network Security Practical**
Subject code	**PUSIT602P**
Level of the Subject	**Moderate**

Practical No	**Details**
1.	Implementing Substitution Ciphers a) Caesar Cipher b) Modified Caesar Cipher c) Monoalphabetic d) Poly-Alphabetic
2.	Implementing Transposition Ciphers a) Rail fence Techniques b) Simple Columnar c) Multi Columnar d) Vernam Cipher
3.	Write a program to implement the Diffie-Hellman Key Agreement algorithm to generate symmetric
4.	Implementing DES Algorithm
5.	Write a program to implement the MD5 algorithm to compute the message digest.
6.	Implementing AES Algorithm
7.	Write a program to implement RSA algorithm to perform encryption / decryption of a given string
8.	. Write a program to calculate HMAC-SHA1 Signature
9.	. Configure Windows Firewall to block: - A port - An Program - A website
10.	Write a program to implement SSL.
	Total No.of Lectures 20

BOS	**Information Technology**
Class	**T.Y.B.Sc. I.T.**
Semester	**VI**
Course Name	**Software Testing**
Course Code	**PUSIT603**
Type of course	**Core**
Level of the Subject	**Advanced**
Credit points	**2**

Course Objectives :

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

Unit No.	Name of Unit	Topic No.	Contents	Hours
1	Introduction to Quality and Testing	1.1	Introduction to Quality: What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Software Quality: Introduction, Quality Management: Quality Control & Quality Assurance	10
		1.2	Fundamentals of testing: Necessity of testing, Testing definition, Testing principles, Fundamental test process, The psychology of testing.	
2	Testing throughout the software life cycle:	2.1	Software development models : V Model, Waterfall model, Iterative models & Agile Test levels,	10
		2.2	Test types: the targets of testing, Maintenance testing; Static techniques: Reviews and the test process, Review process, Static analysis by tools	

3	Testing Techniques	3.1	Test design techniques: Identifying test conditions and designing test cases, Categories of test design techniques,	10
		3.2	Specification-based or black box techniques, Structure-based or white-box techniques, Experience based techniques	
4	Test management	4.1	Test management: Test organization, Test plans, estimates, and strategies, Test progress monitoring and control, Configuration management, Risk and testing, Incident management	10
		4.2	Tool support for testing: Types of test tool, Effective use of tools: Potential benefits and risks, Introducing a tool into an organization	
Total No. of Lectures				**40**

Course Outcomes:

1. Illustrate the concept of Quality Assurance, Quality Control
2. Relate Quality and Software Testing.
3. Apply software testing techniques.
4. Familiar with the open source testing tools.
5. Identify the reasons for bugs and analyze the principles in software testing to prevent and remove bugs.
6. Prepare test plans and schedules for testing and quality assurance projects.

References :

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

CASE STUDY	
1	1.Consider a software application named "Library Management System" designed to automate library operations. The key features outlined in the SRS include: User Authentication: ○ Users must log in with a valid username and password. ○ Different user roles include librarian and regular user. Book Search and Checkout: ○ Users can search for books based on title, author, or genre. ○ A user should be able to borrow a book if available. Return Book: ○ Users can return borrowed books. ○ Overdue books will incur fines. Book Reservation: ○ Users can reserve a book if it is currently checked out. ○ Users receive notifications when a reserved book becomes available.
2	Imagine a software application called "Online Shopping Cart" that allows users to browse products, add items to their cart, and proceed to checkout. The system should support multiple users simultaneously and ensure a secure and seamless shopping experience. Below are some key features specified in the SRS: 1. User Registration: Users should be able to create an account by providing their email, password, and personal details. 2. Username and Password Guidelines ● Must be between six and 50 characters long. ● Can contain any letters from a to z and any numbers from 0 through 9. ● Username is not case-sensitive. ● Password can contain spaces and some special characters, including @ (at sign) . ... ● Password can contain non-English characters (such as é). 3. Product Search: Users can search for products based on specific categories, valid keywords, or brands. 4. Add to Cart: Users should be able to add products to their shopping cart. 5. Checkout Process: Users can view and edit the items in their cart, provide shipping details, and complete the purchase.

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**VI**
Course Name	**Digital Marketing**
Course Code	**PUSIT604 (a)**
Level of Subject	**Medium**

Course Objectives:

1. To understand the basics of Digital Marketing and the jargons involved in the subject.
2. To get well-versed with Digital Marketing best practices.

Unit No	Name of the Unit	Topic No.	Content	Hours
1	Fundamentals of Marketing and Introduction to Digital Marketing	1.1	What is Marketing,Principles of Marketing & Fundamentals of Marketing,What is Digital Marketing? Understanding marketing through the internet Definition of digital marketing; origin of digital Marketing, Benefits of Digital marketing e.g. reach, scope, immediacy, interactivity, How Can Digital Marketing be the Ultimate Tool for Success for Businesses?	10
		1.2	Trends & Scenarios of the Digital Marketing Industry, Difference between traditional marketing and digital marketing, Importance of digital marketing, The internet micro- and macro-environment, Internet users in India	
2	Toolkit for Digital Marketing	2.1	How to conduct a competitive analysis? How to use digital marketing to increase sales? The internet marketing mix: product and branding; place e.g., channels, virtual Organizations; price e.g., auctions; promotions; people; processes; physical evidence.	10
		2.2	Digital marketing tools/e-tools; the online marketing matrix including business and Consumer markets; the online customer Interactive order processing: choosing a supplier; selecting a product; check stock,	
		2.3	Brand awareness, credibility, and delivery among consumers, Availability; placing order; authorization of payment; input of data; data transfer; Order processing; online confirmation and delivery information; tracking of order; Delivery; data integrity and security systems;	

3	Search Engine Optimization (SEO)	3.1	What is SEO? History & Growth of SEO, definition of search engine Optimization (SEO); advantages and disadvantages of SEO; best practice in SEO, On-Page Optimization, Off-Page Optimization Keywords, Google Adwords, Search engine marketing (SEM): definition of SEM	10
		3.2	Paid search engine marketing, pay per click advertising (PPC); landing pages; long Tail concept; geo-targeting e.g. Google Ad Words; opt in email and email Marketing, Market research Customer relationship Marketing, Internet communities,	
4	Marketing Plan and Content Marketing	4.1	Design a Digital Marketing plan, Design digital marketing plan, SWOT, situational analysis, key performance Indicators in internet marketing, Digital Landscape, P-O-E-M Framework.	10
		4.2	What is Content Marketing? History of Content Marketing, Advantages and Disadvantages of Content Marketing. Article and blog writing, Promotion and Branding, Blogging, Content marketing tools and systems	
Total No. of Lectures				**40**

Course Outcomes:

1. Understand basics of Digital Marketing and the approaches used in Traditional as well as Digital Marketing.
2. Understand the workaround behind product branding and its marketing by analyzing internet trends and user behavior.
3. Go through the tools used in Digital Marketing to analyse the consumer behaviour with respect to credibility and awareness amongst users.
4. To understand Search Engine Optimization and Search Engine Marketing techniques.
5. Analyze the importance of Consumer relations and SWOT analysis in Digital Marketing.
6. To implement the concepts in Content Marketing.

References:

1.Digital Marketing Strategy: An Integrated Approach to Online Marketing by Simon Kingsnorth.
2.SEO For Beginners: An Introduction To SEO Basics ebook by Loren Baker,Julie Joyce,Ryan Jones,Danny Goodwin.
3. Chaffey, D., & Ellis-Chadwick, F. (2019). Digital Marketing: Strategy, Implementation and Practice (7th ed.). Pearson.
4. Smith, P.R., & Zook, Z. (2016). Marketing Communications: Integrating Offline and Online with Social Media (5th ed.). Kogan Page.
5. Scott, D.M. (2016). The New Rules of Marketing & PR: How to Use Social Media, Online Video, Mobile Applications, Blogs, News Releases, and Viral Marketing to Reach Buyers Directly (5th ed.). Wiley.

CASE STUDY	
1)	boAt is often regarded as India's fastest growing audio & wearables brand. Reports suggest that the sales of boAt headphones have gone further up a notch, courtesy of the investment-raising show that had rocked the TRP charts and social media trends in early 2022.. BoAt wanted to create value for the users so they started looking to solve common problems reported by the youth. It was the time when Apple users were suffering because of their charger getting damaged without any apparent reason. So they decided to make an Apple charger that could withstand wear and tear for long, and they were quite successful at that.Later, the company went on to add a number of quality products such as earbuds, headphones, smart watches, wireless speakers, etc to its product range. As of December 2020, boAt was already selling 14,000+ products in India every single day. Established audio electronics brands like JBL had to drop down their prices in order to stay relevant in the target industry.The company struggled in the first two years of its operation (2016-2018), mainly because of the lack of funding. However, once the company raised INR 6 crores from Fireside ventures, there was no looking back.
2)	Lenskart, the leading online eyewear retailer, harnessed the power of a multi-faceted digital marketing approach. This encompassed a blend of search engine optimization, social media advertising, and email marketing, resulting in remarkable outcomes. Their strategy led to a significant surge in website traffic, boosted online sales, and elevated brand recognition.What made Lenskart's strategy even more effective was their shrewd utilization of influencer marketing and tailored promotional campaigns, further amplifying their achievements. By prioritizing the customer experience, Lenskart not only enhanced their online sales but also forged a formidable brand presence in the fiercely competitive eyewear market. They have evolved beyond mere vision correction tools, now symbolizing both knowledge and style while enhancing our view of the world. It was initiated to assist approximately one-third of the Indian population grappling with vision problems, making quality eyewear and lenses accessible at an affordable cost.The age group of 35-44 constitutes 12.01% of Lenskart's consumer base, and they are the leading contributors to engagement.Regarding gender demographics, the majority, comprising 62.30%, are male, with the remaining 37.70% being female consumers.

BOS	**Computer Science**
Class	**T.Y.B.Sc. I.T.**
Semester	**VI**
Course Name	**Digital Marketing Practical**
Course Code	**PUSIT604 (a)P**
Level of Subject	**Medium**

Practical No.	**Details**
1	Introduction to WordPress.
2	Create a simple website using WordPress
3	How to perform keyword research through Google Keyword Planner
4	Create On page Documentation of any site of any choice.
5	Perform off Page Activities of any site of choice.
6	Perform Keyword Mapping
7	Understanding Google Trends (Niche Selection)
8	Understand Guest blogging
9	Create a Youtube Channel and perform basic Subscriber analytics.
10	Understand Content marketing
Total No of Lectures:20	

BOS	**Computer Science**
Class	**T.Y.B.Sc. IT**
Semester	**VI**
Course Name	**Business Intelligence**
Course Code	**PUSIT605**
Level of the Subject	**Advanced**

Course Objectives:

1. To Study the importance of Business Intelligence.
2. To identify how various business intelligence can contribute to organizational success.

Unit No.	Name of Unit	Topic No.	Content	Hours
1	Introduction to Business intelligence	1.1	Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	10
		1.2	Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models	
2	Methods and models Data Exploration	2.1	Data mining: Definition of data mining, Representation of input data , Data mining Process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	10

		2.2	Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	
		2.3	Exploration: Graphical analysis of bivariate variables using scatter plots ,Loess plots, Level curves ,box plots	
3	Business intelligence application	3.2	Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	10
		3.3	Artificial Neural Network: Introduction, Fundamental Concept, Artificial Neural Network, Brain vs. Computer - Comparison Between Biological Neuron and Artificial Neuron, Basic Models of Artificial NeuralMNetwork	
4	Knowledge management and Artificial Intelligence	4.1	Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology(IT) In Knowledge management, Knowledge Management Systems Implementation, Roles of People in,Knowledge Management	10
		4.2	Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	
Total No. of Lectures				**40**

Course Outcomes:

1. Recite various Definitions/Capabilities of DSS/Data/applications/components/terms with their meaning that are used in BI.
2. Know about different problems faced by the organization in its growth with the help of

graphs.
3. Apply the computerized mechanism used to overcome problems faced by the company.
4. Identify advanced techniques use to increase the growth of the company.
5. Apply different strategies in order to evaluate the growth of the company.
6. Design the business intelligence software for the companies

References:

1. Artificial Intelligence: A modern approach by Stuart Russel and Peter Norvig, Pearson 3 Rd edition.
2. A First Course in Artificial Intelligence by Deepak Khemani,TMH First Edition
3. Artificial Intelligence by Elaine Rich, Kelvin Knight and Shivshankar Nair,TMH,3rd edition.
4. Artificial Intelligence: A Rational Approach by Rahul Deva ,Shroff publishers 1 st edition
5. Artificial Intelligence & Soft computing for Beginners by Anandita Das ,Bhattacharjee,SPD,1st edition

CASE STUDY	
1)	FastFood Corner, a beloved fast-food spot, faces issues like unhappy customers, messy inventory, repetitive menu, and slow operations. To fix this, they plan to use smart tools, listen to customers, manage inventory better, and update their menu. Their goal: to win back customers and thrive again.The management is keen on identifying and addressing these issues to regain customer satisfaction, boost profitability, and ensure long-term success. How they can do this?Once the problem is solved and their customers are back. Now they want to switch towards the online food delivery across entire state. To do so they have planned to launched their website from where customers can book their food online. Their aim is to develop the website which is similar to top leading online food service. How this can be done?One of the dataset of this company contains information about the weight (in kilograms) and height (in centimeters) of customers. The weight ranges from 50kg to 100kg, and height ranges from 150 cm to 200cm. The company wants to convert these nos within the range of -1 to 1 for further analysis. How they can do it?
2)	ABC University is analyzing exam scores for a challenging mathematics course. The scores, ranging from 65 to 90, exhibit variability. The university seeks insights into the performance distribution and trends among students. Through this analysis, ABC University aims to identify areas for improvement and enhance academic support for its students.The university aims to gain insights into the performance variation between the students performance and identify any potential outliers in the exam scores. The score o f the students are as follows 70, 72, 68, 85, 88, 76, 82, 90, 65, 78 How they can do this. ABC University is dedicated to ensuring the academic success of its students. However, the university is facing challenges in effectively monitoring student performance, identifying at-risk students, and providing timely interventions to support their academic journey. To address these challenges, the university decides to implement a Decision Support System (DSS) focused on student academic support. Explain the structure of this DSS. Draw the diagram and explain the network of the relationship involved in ABC university from business point of view

BOS	**Computer Science**
Class	**T.Y.B.Sc. IT**
Semester	**V**
Course Name	**Business Intelligence Practicals**
Course Code	**PUSIT605 P**
Type of course	**Basic**
Level of the Subject	**Advanced**

Practical No.	Topic
1	a. Downloading & Installing MongoDB on System b. Perform the Following operation using MongoDB ● Create Database ● Drop Database ● Create Collection ● Drop Collections
2	Perform the Following operation using MongoDB ● Insert Document ● Query Document ● Update Document ● Delete Document ● Projection ● Limiting Records
3	Import the legacy data from Mongodb sources and load in the target system.
4	Build an OLAP Cube in SSAS from MongoDB Data
5	Execute the MDX queries to extract the data from the data warehouse
6	a. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.

7	Perform the data classification using a classification algorithm.
8	Perform the data clustering using a clustering algorithm.
9	Perform the Linear regression on the given data warehouse data.
10	Perform the logistic regression on the given data warehouse data.
Total No. of Lectures 20	

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