



**JAI HIND COLLEGE  
BASANTSING INSTITUTE OF SCIENCE  
&  
J.T.LALVANI COLLEGE OF COMMERCE  
(AUTONOMOUS)**

"A" Road, Churchgate, Mumbai - 400 020, India.

**Affiliated to  
University of Mumbai**

Program: B.Sc IT

Proposed Courses: S.Y.BSc.IT

Semester IV

**Credit Based Semester and Grading System (CBCS) with effect from  
the academic year 2022-23**

**S.Y.BSc. IT**

**Academic year 2022-2023**

<b>Semester IV</b>			
<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>	<b>Lectures /Week</b>
SBIT401	.Net Technologies with MVC	3	5
SBIT402	Physical Computing and IoT Programming	3	5
SBIT403	Computer Oriented Numerical and Statistical Techniques	3	5
SBIT404	Software Methodologies and Management	2	5
SBIT405	Advanced Networks and Security	3	5
SBIT401 PR	.Net Technologies with MVC Practical	2.5	3
SBIT402 PR	Physical Computing and IoT Programming Practical	2.5	3
SBIT403 PR	Computer Oriented Numerical and Statistical Techniques Practical	2.5	3
SBIT404 PR	Software Methodologies and Management Practical	2	3
SBIT405 PR	Advanced Networks and Security Practical	2.5	3

### Semester IV – Theory

<b>Course Code:</b> <b>SBIT401</b>	<b>Course Title: .Net Technologies with MVC (Credits: 03 Lectures/Week:05)</b>	
	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ This course is designed to understand the basic object-oriented concepts through C# and will help students create applications and projects using the same language.</li> <li>➤ To provide insight into .NET technologies for web programming and enable them to design and develop interactive and responsive web applications with MVC architecture.</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>➤ Develop a proficiency in the C# programming language and create applications with strong object oriented principles</li> <li>➤ Understand the core MVC concepts</li> <li>➤ Proficiently develop ASP.NET web applications using C# and MVC</li> <li>➤ Implementing Navigation in MVC web apps</li> <li>➤ Understanding the entity framework</li> <li>➤ Learn how to create backend using LINQ and query databases using Entity Framework.</li> <li>➤ Understand the working of ASP.NET Web API.</li> </ul>	
<b>Unit I</b>	<p><b>Introduction to C#:</b> C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. The Basics About Classes, Understanding Namespaces and Assemblies, Advanced Class Programming, Inheritance, Delegates, Debugging and Error Handling</p> <p><b>Introducing .NET:</b> The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.</p> <p><b>XML:</b> XML Explained The XML Classes, XML Validation, XML Display and Transforms.</p>	<b>15 L</b>
<b>Unit II</b>	<p><b>Web Form Controls:</b> Writing Code, Using the Code-Behind Class, Introducing Server Controls, List Controls, Table Controls, Web Control Events and AutoPostBack, The Calendar, The AdRotator, Pages with Multiple Views, User Controls</p> <p><b>Navigation Controls:</b> Site Maps, The Site Map Path Control, The Tree View Control, The Menu Control.</p> <p><b>Getting Started with MVC:</b> A Quick Introduction to ASP.NET MVC, ASP.NET MVC 5 Overview, Installing MVC 5, The MVC Application Structure, project templates.</p> <p><b>Controllers:</b> The Controller's Role, Controller Basics.</p> <p><b>Views:</b> The Purpose of Views, View Basics, Understanding View Conventions, Strongly Typed Views, View Models, adding a View, The Razor View Engine, Specifying a Partial View.</p> <p><b>Models:</b> Modeling, Scaffolding, Model Binding.</p>	<b>15 L</b>

<b>Unit III</b>	<p><b>Forms and Html Helpers:</b> Using Forms, HTML Helpers, Input Helpers, Rendering Helpers</p> <p><b>Data Annotations and Validation:</b> Annotating Orders for Validation, Custom Validation Logic</p> <p><b>Routing:</b> Uniform Resource Locators, How Routes Generate URLs, Custom Route Constraints</p> <p><b>State Management:</b> Using hidden fields, query string, ViewData, ViewBag, TempData, Session and Cookie State.</p> <p><b>View Techniques:</b> Defining a layout / MVC2, MVC3, MVC4 Master Page, Using Styles.</p>	<b>15 L</b>
<b>Unit IV</b>	<p><b>Entity Framework:</b> Entity Framework Introduction, EF Architecture, Database First Approach, Code First Approach, Model First Approach, CRUD Operations using Repository Pattern, Scaffolding in Asp.Net MVC</p> <p><b>ASP.NET MVC &amp; LINQ - working with Data:</b> What is LINQ? Why to use it? LINQ API, LINQ Query syntax, LINQ Method syntax, LAMBDA Expressions, Standard Query Operators, creating simple LINQ queries, Using LINQ queries in a Web application</p> <p><b>The ASP.NET Web API:</b> Building a Data Service, Paging and Querying Data, Exception Handling, Media Formatters</p> <p><b>Research Component:</b> Developing MVC based Web application with the entity framework</p>	<b>15 L</b>
<p><b>Textbook:</b></p> <ol style="list-style-type: none"> <li>1. Beginning asp.net 4.5 in c# by Matthew MacDonald.</li> <li>2. Programming ASP.NET 3.5 by Jesse Liberty, Dan Maharry, Dan Hurwitz, O'Reilly</li> <li>3. Professional ASP.NET MVC 5 by Jon Galloway, Brad Wilson, K. Scott Allen, David Matson.</li> <li>4. Programming ASP.Net MVC 4 by Jess Chadwick, Todd Snyder, and Hrusikesh Panda</li> <li>5. Pro ASP.Net MVC 5 by Adam Freeman</li> <li>6. <a href="https://www.tutlane.com/tutorial/aspnet-mvc/different-types-of-project-templates-in-asp-net-mvc">https://www.tutlane.com/tutorial/aspnet-mvc/different-types-of-project-templates-in-asp-net-mvc</a></li> <li>7. <a href="https://www.c-sharpcorner.com/article/state-management-in-asp-net-mvc/">https://www.c-sharpcorner.com/article/state-management-in-asp-net-mvc/</a></li> <li>8. <a href="https://www.c-sharpcorner.com/article/master-page-concept-in-mvc/">https://www.c-sharpcorner.com/article/master-page-concept-in-mvc/</a></li> <li>9. <a href="https://www.tutlane.com/tutorial/aspnet-mvc/using-entity-framework-in-asp-net-mvc-4-with-example">https://www.tutlane.com/tutorial/aspnet-mvc/using-entity-framework-in-asp-net-mvc-4-with-example</a></li> <li>10. <a href="https://www.tutorialsteacher.com/linq">https://www.tutorialsteacher.com/linq</a></li> </ol>		

### Evaluation Scheme

[A] Evaluation scheme for Theory courses

**I. Continuous Assessment ( C.A.) - 40 Marks**

**(i) C.A.-I : Test – 20 Marks of 40 mins. duration**

**(ii) C.A.-II :Mini Project- 20 Marks**

**II. Semester End Examination ( SEE)- 60 Marks**

<b>Course:</b> <b>SBIT402</b>	<b>Physical Computing and IoT Programming (Credits : 03 Lectures/Week: 05 )</b>	
	<b>Objectives:</b> <ul style="list-style-type: none"> <li>➤ To learn IP as IoT network layer</li> <li>➤ How security and privacy is achieved in IoT</li> <li>➤ Advanced topics in IoT including data analytics and tools for IoT.</li> </ul> <b>Outcomes:</b> <ul style="list-style-type: none"> <li>➤ Students will be well versed with IoT and Programming the Raspberry Pi.</li> </ul>	
<b>Unit I</b>	<b>Introduction and system Architecture</b> - What Is IoT?, IoT Impact, Convergence of IT and OT , IoT Challenges, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack, Sensors, Actuators, Sensor Networks, Communications Criteria, IoT Service as a Platform.	<b>15 L</b>
<b>Unit II</b>	<b>IP as the IoT Network Layer</b> - The Need for Optimization, Optimizing IP for IoT, Profiles and Compliances.  <b>Application Protocols for IoT</b> - The Transport Layer, IoT Application Transport Method.  <b>Security and Privacy in the Internet of Things</b> –IoT security overview, security frameworks for IoT, Privacy in IoT networks.	<b>15 L</b>
<b>Unit III</b>	<b>Prototyping Embedded Devices:</b> Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.  <b>IoT Platform Design Methodology:</b> Purpose and requirement specification, Process specification, Domain model specification, Information model specification, Service specifications IoT level specification, Functional view specification, Operational view specification, Device and component integration, Application development.	<b>15 L</b>
	<b>Data and Analytics for IoT</b> - An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytic, Network Analytics.  <b>IoT physical Servers and cloud offerings</b> - Introduction to cloud storage Models and communication APIs, Python web application	<b>15 L</b>

<b>Unit IV</b>	framework – Django, Designing RESTful Web API, Amazon Web Services for IoT.	
<p><b>Textbook:</b></p> <ol style="list-style-type: none"> <li>1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press.</li> <li>2. Internet of Things: Hands On Approach by Arshdeep Bahga, Vijay Madisetti.</li> <li>3. Internet of Things Principles and Paradigms by Rajkumar Buyya and Amir Vahid Dastjerdi</li> <li>4. Designing the Internet of Things Adrian McEwen, Hakim Cassimally WILEY.</li> </ol>		

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**II. Semester End Examination ( SEE)- 60 Marks**

<b>Course:</b> <b>SBIT403</b>	<b>Course Title: Computer Oriented Numerical and Statistical Techniques</b> <b>(Credits: 03 Lectures/Week: 05)</b>	
	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Statisticians help to design data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses. The central objective of the undergraduate major in Statistics is to equip students with consequently requisite quantitative skills that they can employ and build on in flexible ways.</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>➤ Perform regression and interpolation on datasets</li> <li>➤ Understand essential aspects of statistical sampling and analysis of experimental data</li> <li>➤ Ability to perform estimation of parameters and hypothesis testing</li> <li>➤ Understand concepts of probability and conditional probability</li> </ul>	
<b>Unit I</b>	<p><b>Introduction to Quantitative Data:</b>  Data, Types of Data, Data visualization, histogram.  <b>Measures of Central Tendency:</b> Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency, The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency. The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation, The Range, The Mean Deviation, The Semi Inter quartile Range, The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Charlie’s Check, Sheppard’s Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient</p>	15 L
<b>Unit II</b>	<p><b>Moments, Skewness, and Kurtosis :</b>Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie’s Check and Sheppard’s Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis</p> <p><b>Elementary Sampling Theory :</b> Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling</p>	15 L

	<p>Theory.</p> <p><b>Distributions:</b> Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, Normal distribution state all the properties and its applications.</p>	
<b>Unit III</b>	<p><b>Statistical Decision Theory:</b> Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, pValues for Hypothesis Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions,</p> <p><b>Small Sampling Theory:</b> Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The ChiSquare Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution.</p> <p><b>The Chi-Square Test:</b> Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coeffi Contingency, Correlation of Attributes, Additive Property of chisquare.</p>	15 L
<b>Unit IV</b>	<p><b>Curve Fitting and the Method of Least Squares:</b> Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.</p> <p><b>Correlation Theory:</b> Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of Correlation Remarks Concerning the Correlation Coefficient Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Line Series, Correlation of Attributes, Sampling Theory of Correlation,</p> <p><b>Theory of Estimation:</b> Characteristics of Estimators, Consistency, Unbiasedness, Sufficiency, Cramer-Rao Inequality, MVUE and Blackwellization, Method of Maximum Likelihood Estimation</p>	15 L
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. STATISTICS, Murray R. Spiegel, Larry J. Stephens., McGRAW – HILL INTERNATIONAL</li> <li>2. Numerical Methods for Engineers, S. S. Shastri, PHI</li> <li>3. FUNDAMENTAL OF MATHEMATICAL STATISTICS, S.C. GUPTA and V.K. KAPOOR, SULTAN CHAND and SONS</li> </ol>		



## Evaluation Scheme

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**I. Continuous Assessment ( C.A.) - 40 Marks**

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(ii) C.A.-II : Assignment- 20 Marks

**II. Semester End Examination ( SEE)- 60 Marks**



<b>Course Code: SBIT404</b>	<b>Course Title: Software Methodologies and Management</b> <b>(Credits : 02 Lectures/Week: 05 )</b>	
	<b>Objectives:</b> Understanding time management, project and resource management. Learning Development methodologies, architecture and designing of software systems  <b>Outcomes:</b> This course is aimed at helping students build up an understanding of how to develop a software system from scratch by guiding them thru the development process and giving them the fundamental principles of system development with object oriented.	
<b>Unit I</b>	<p><b>Introduction:</b> What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p><b>Socio-technical system:</b> Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of systems such as organization, people and computers, Dealing Legacy Systems.</p> <p><b>Critical system:</b> Types of critical system, A simple safety critical system, dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p>Software Processes: Process and Project, Component Software Processes.</p> <p><b>Software Development Process Models:</b> Waterfall Model, Prototyping, Iterative Development, Rational Unified Process, The RAD Model, Time boxing Model, DevOps Software Development Life Cycle, Lean Software Development Life Cycle, Feature Driven Development, Joint Application Development, Dynamic System Development.</p> <p><b>Agile software development:</b> Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods, Scrum, Sprint.</p> <p><b>Software Requirements:</b> Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.</p>	<b>15 L</b>

<p><b>Unit II</b></p>	<p><b>Requirements Engineering Processes:</b> Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.</p> <p><b>System Models:</b> Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods. Architectural Design: System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p><b>User Interface Design:</b> The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p>Software Project Management: Introduction, What is Project Management? Management activities, Project Planning, Project Scheduling, Risk Management, Boehm’s top 10, WBS, PERT, Monte Carlo, Critical chain. Management Control, Project Management Life Cycle, Plans, Methods and Methodologies, Some Ways of</p> <p>Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure,</p> <p>Traditional versus Modern Project Management Practices. 10 Steps of Project Planning: : Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4:</p> <p>Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning</p> <p>Selection of an Appropriate Project Approach based on Software</p> <p><b>Development Process Models:</b> Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, Selecting the Most Appropriate Process Model</p>	<p><b>15 L</b></p>
<p><b>Unit III</b></p>	<p><b>Quality Management:</b> Process and Product Quality, Quality assurance and, Quality Control. Software Testing: Introduction to testing, What is a test case? Why</p> <p>testing important? Types of testing: System Testing and Components Testing, What is Verification and Validation?</p> <p><b>Software Measurement and Metric:</b> Size-Oriented Metrics,</p>	<p><b>15 L</b></p>

	<p>Function-Oriented Metrics, Extended Function Point Metrics, Software effort estimation, AlbrechtFunctionPoint, Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO and COCOMO II: Introduction, types, classes, A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.</p> <p><b>Software Cost Estimation:</b> Estimation, Project Duration and Staffing.</p> <p><b>Process Improvement:</b> Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.</p> <p>Service Oriented Software Engineering: Service Oriented Architecture(SOA), Services as reusable components, Service Engineering, Software Development with Services</p>	
<p><b>Unit IV</b></p>	<p><b>Software reuse:</b> The reuse landscape, Application frameworks, Software product lines, COTS product reuse, Component Based Software Engineering(CBSE).</p> <p><b>Fundamentals of testing:</b></p> <p>Necessity of testing, what is it, Testing principles, Fundamental test process, The psychology of testing, Test scenario, test plan and its format, test cases</p> <p><b>Test design techniques:</b> Identifying test conditions and designing test cases, Categories of test design techniques, Specification-based or black box techniques Structure-based or white-box techniques, Experience based techniques.</p>	<p><b>15 L</b></p>
<p><b>Textbook:</b></p> <ol style="list-style-type: none"> <li>1. Software Engineering, Ian Somerville ,Pearson Education,Ninth Edition</li> <li>2. Software Engineering, PankajJalote ,Narosa Publication</li> <li>3. Software engineering, a practitioner’s approach, Roger Pressman,TataMcgraw-hill, Seventh Edition, 2018</li> <li>4. Project Management and Tools &amp; Technologies , ShaileshMehta,SPD,First 2017</li> <li>5. Software Project Management, Walker Royce, Pearson, 2005</li> </ol>		

6. FOUNDATIONS OF SOFTWARE TESTING by Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black.

### Evaluation Scheme

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- I. Continuous Assessment (C.A.) - 40 Marks
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- II. Semester End Examination (SEE)- 60 Marks



<b>Course Code:</b> <b>SBIT405</b>	<b>Course Title: Advanced Networks and Security (Credits: 03 Lectures/Week:05)</b>	
	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Provide an in-depth view of the advanced technologies used in enterprise-wide computer networks.</li> <li>➤ Provide the theoretical foundation and practical skills of advanced computer networks.</li> <li>➤ Understanding Wireless LAN Design, WAN Technologies and the Enterprise Edge</li> <li>➤ Students will learn the basic concepts in computer security including software vulnerability analysis and defense, networking and wireless security, applied cryptography, as well as ethical, legal, social and economic facets of security.</li> </ul> <p><b>Outcomes:</b></p> <p>Upon the completion of the course students will be able to:</p> <ul style="list-style-type: none"> <li>➤ Analyze state-of-the-art real-world enterprise-wide networks.</li> <li>➤ Design and build advanced enterprise-wide computer networks.</li> <li>➤ Analyze Enterprise LAN, Wireless LAN, WAN technologies design.</li> <li>➤ Identify some of the factors driving the need for Computer security</li> <li>➤ Identify physical points of vulnerability in simple networks</li> <li>➤ Design and implement appropriate security technologies and policies to protect computers and digital information</li> </ul>	
<b>Unit I</b>	<p><b>General Network Design:</b> Network Design Methodology, Architectures for the Enterprise, Borderless Networks Architecture, Collaboration and Video Architecture, Data Center and Virtualization Architecture, Design Lifecycle: Plan, Build, Manage Plan Phase Build Phase Manage Phase Prepare, Plan, Design, Implement, Operate, and Optimize Phases Prepare Phase Plan Phase Design Phase Implement Phase Operate Phase Optimize Phase Summary of PPDIOO Phases Project Deliverables Design Methodology Identifying Customer Design Requirements Characterizing the Existing Network Steps in Gathering Information Network Audit Tools Network Checklist Designing the Network Topology and Solutions Top-Down Approach Pilot and Prototype Tests Design Document.</p> <p><b>Network Design Models:</b> Hierarchical Network Models Benefits of the Hierarchical Model, Hierarchical Network Design, Core Layer, Distribution Layer, Access Layer, Hierarchical Model Examples, Hub- and-Spoke, Design Collapsed Core, Design Enterprise Architecture Model, Enterprise Campus Module, Enterprise Edge Area, E-Commerce Module, Internet Connectivity Module, VPN/Remote Access, Enterprise WAN, Service Provider Edge Module, Remote Modules, Enterprise Branch Module, Enterprise Data Center Module, Enterprise Teleworker Module, High Availability Network Services, Workstation-to-Router Redundancy and LAN, High Availability Protocols, ARP Explicit Configuration, RDP, RIP, HSRP, VRRP, GLBP, Server</p>	<b>15 L</b>

	<p>Redundancy, Route Redundancy, Load Balancing, Increasing Availability, Link Media Redundancy.</p> <p><b>Information Security Overview:</b> The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. <b>Risk Analysis:</b> Threat Definition, Types of Attacks, Risk Analysis.</p>	
<p><b>Unit II</b></p>	<p><b>Enterprise LAN Design:</b> LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules, 1000BASE-LX Long-Wavelength Gigabit Ethernet, 1000BASE-SX Short-Wavelength Gigabit Ethernet, 1000BASE-CX Gigabit Ethernet over Coaxial Cable, 1000BASE-T Gigabit Ethernet over UTP 86, 10 Gigabit Ethernet Design Rules, 10GE Media Types, Ether Channel, Comparison of Campus Media LAN Hardware, Repeaters, Hubs, Bridges, Switches, Routers, Layer 3 Switches, Campus LAN Design and Best Practices Best Practices for Hierarchical Layers, Access Layer Best Practices, Distribution Layer Best Practices, Core Layer Best Practices, STP Design Considerations, STP Toolkit, Port Fast, Uplink Fast, Backbone Fast, Loop Guard, Root Guard, BPDU Guard, BPDU Filter, VLAN and Trunk Considerations, Unidirectional Link Detection (UDLD) Protocol, Large-Building LANs, Enterprise Campus LANs, Edge Distribution, Medium-Size LANs, Small and Remote Site LANs, Server Farm Module, Server Connectivity Options, Enterprise Data Center Infrastructure, Campus LAN QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping.</p> <p><b>Data Center Design:</b> Enterprise DC Architecture, Data Center Foundation Components, Data Center Topology Components, Data Center Network Programmability, SDN, Controllers, APIs, ACI, Challenges in the DC, Data Center Facility Aspects, Data Center Space, Data Center Power, Data Center Cooling, Data Center Heat, Data Center Cabling, Enterprise DC Infrastructure, Data Center Storage, Data Center Reference Architecture, Defining the DC Access Layer, Defining the DC Aggregation Layer, Defining the DC Core Layer, Security in the DC, Fabric Extenders, Virtualization Overview, Challenges, Defining Virtualization and Benefits, Virtualization Risks, Types of Virtualization, Virtualization Technologies, VSS, VRF, vPC, Device Contexts, Server Virtualization, Server Scaling, Virtual Switching, Network Virtualization Design Considerations, Access Control, Path Isolation, Services Edge, Data Center Interconnect, DCI Use Cases, DCI Transport Options, DCI L2 Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.</p>	<p><b>15 L</b></p>

<p><b>Unit III</b></p>	<p><b>Wireless LAN Design:</b> Wireless LAN Technologies, WLAN Standards, ISM and UNII Frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X- 2001 Port-Based Authentication, Dynamic WEP Keys and LEAP, Controlling WLAN Access to Servers, WLAN Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intra controller Roaming, Layer 2 Inter controller Roaming, Layer 3 Inter controller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh Design Recommendations, Campus Design Considerations, Power over Ethernet (PoE), Wireless and Quality of Service (QoS), Branch Design Considerations, Local MAC, REAP, Hybrid REAP, Branch Office Controller Options.</p> <p><b>WAN Technologies and the Enterprise Edge:</b> WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Frame Relay, Time-Division Multiplexing, Metro Ethernet, SONET/SDH, Multiprotocol Label Switching (MPLS), Dark Fiber, Dense Wavelength-Division Multiplexing, Ordering WAN Technology and Contracts, WAN and Edge Design Methodologies, Response Time, Throughput, Reliability, Bandwidth Considerations, WAN Link Categories, Optimizing Bandwidth Using QoS, Queuing, Traffic Shaping and Policing, Classification, Congestion Management, Priority Queuing, Custom Queuing, Weighted Fair Queuing, Class-Based Weighted Fair Queuing, Low-Latency Queuing, Traffic Shaping and Policing, Link Efficiency, Window Size, DMZ Connectivity, Segmenting DMZs, DMZ Services, Internet Connectivity, Centralized Internet (Branch) vs. Direct Internet (Branch), High Availability for the Internet Edge, VPN Network Design.</p>	<p><b>15 L</b></p>
<p><b>Unit IV</b></p>	<p><b>Secure Design Principles:</b> The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p> <p><b>Authentication and Authorization:</b> Authentication, Authorization</p> <p><b>Encryption:</b> A Brief History of Encryption, Symmetric- Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p> <p><b>Firewalls:</b> Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p><b>Wireless and WAN Security:</b> Radio Frequency Security Basics, Data- Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and</p>	<p><b>15 L</b></p>



	<p>Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.</p> <p><b>Intrusion Detection and Prevention Systems:</b> IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).</p> <p><b>Research Component: On Network Design</b></p>	
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**Textbook:**

11. CCDA200-310 Official Cert Guide, ANTHONY BRUNO, CCIE No. 2738, STEVE JORDAN, CCIE No. 11293, Cisco Press 2.
12. Network Warrior, Gary A Donabue, O Reilly, 2nd Edition, 2011 3.
13. The Complete Reference: Information Security, Mark Rhodes-Ousley, McGraw- Hill 2nd Edition, 2013

**Evaluation Scheme**

**[A] Evaluation scheme for Theory courses**

**I. Continuous Assessment ( C.A.) - 40 Marks**

**(i) C.A.-I : Test – 20 Marks of 40 mins. duration**

**(ii) C.A.-II : Mini project- 20 Marks**

**II. Semester End Examination ( SEE)- 60 Mark**

## Semester IV – Practical

<b>Course Code:</b> <b>SBIT401PR</b>	<b>Practical Title: .Net Technologies with MVC Practical</b> <b>(Credits : 2.5 Practicals/Week: 03)</b>
	<p><b>1.Working with basic C# and ASP.NET</b></p> <p>a. Create simple application to perform following operations</p> <ul style="list-style-type: none"><li>i. Finding Factorial Value</li><li>ii. Generate Fibonacci series.</li><li>iii. Test for prime numbers.</li><li>iv. Test for vowels.</li></ul> <p>b) Create an application to demonstrate String and Array Operations</p> <p>c) Create an application that receives the following information from a set of students: StudentId, StudentName, CourseName, Date of Birth. The application should also display the information of all the student once the data entered</p> <p><b>2.Working with Object Oriented C# and ASP.NET</b></p> <p>a) Create a simple application to perform following operations</p> <ul style="list-style-type: none"><li>i. Function Overloading</li><li>ii. Inheritance (all types)</li><li>iii. Constructor overloading</li><li>iv. Interfaces</li></ul> <p>b) Create a simple application to demonstrate use of following concepts</p> <ul style="list-style-type: none"><li>i. Using Delegates and events</li><li>ii. Exception handling</li></ul> <p><b>3. Create a web application to demonstrate use of reading and writing operation with XML</b></p> <p><b>4. Working with Web forms and Controls</b></p> <ul style="list-style-type: none"><li>i. Create a simple web page with various server controls to demonstrate setting and use of their properties (Example: AutoPostBack)</li><li>ii. Demonstrate the use of Calendar Control</li><li>ii. Create a web form to demonstrate use of Adrotator Control</li></ul> <p><b>5. Creating a basic MVC based web application</b></p> <p><b>6.Working with Razor view</b></p> <p><b>7.Working with validation in a web application</b></p> <p><b>8.Create Web Form to demonstrate use of Website Navigation controls</b></p>

**9.Implementing state management in MVC applications.**

**10.Working with Master Pages and styles**

**11.**

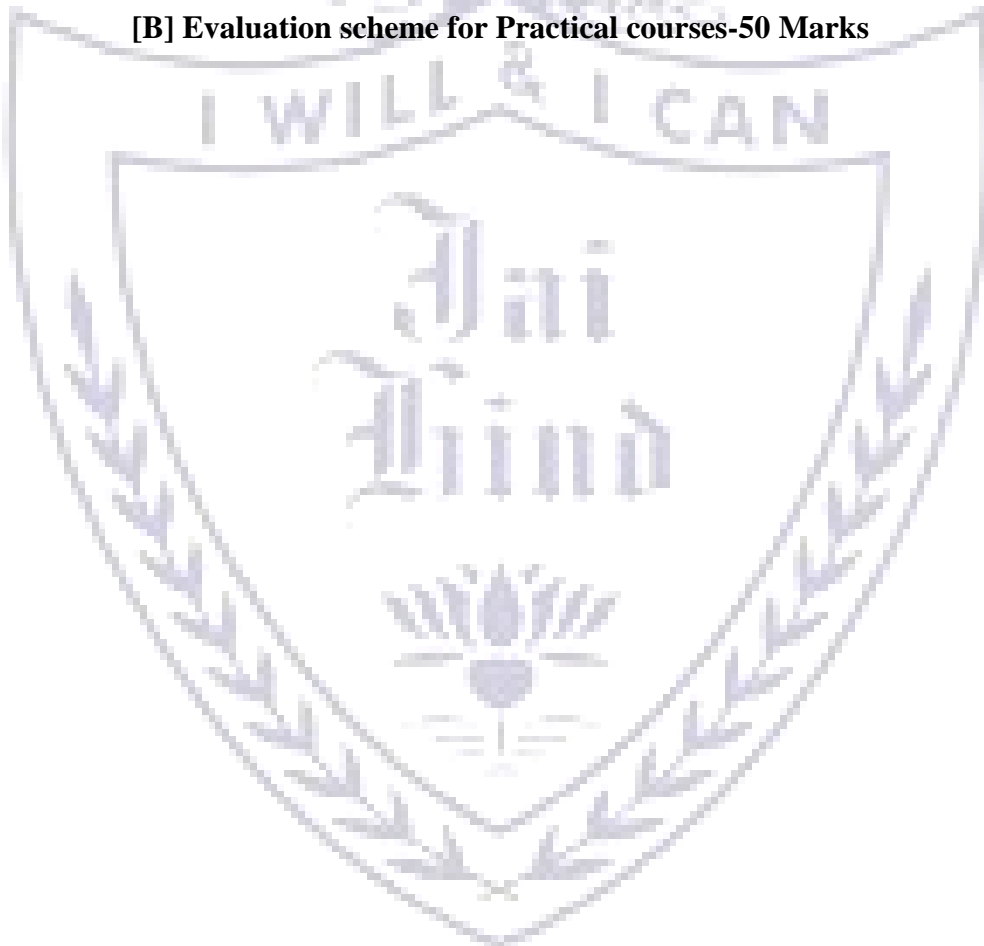
**a) Create a web application to display records by using a database.**

**b) Working with data using Linq**

**12.Working with ASP.NET Web API in MVC**

**Evaluation Scheme**

**[B] Evaluation scheme for Practical courses-50 Marks**



<b>Course: SBIT402PR</b>	<b>Physical Computing and IoT Programming Practical (Credits : 2.5 Practicals /Week: 03)</b> <ol style="list-style-type: none"> <li>1.Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.</li> <li>2.Displaying different LED patterns with Raspberry Pi.</li> <li>3.Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.</li> <li>4.Controlling Raspberry Pi with WhatsApp.</li> <li>5.Fingerprint Sensor interfacing with Raspberry Pi.</li> <li>6.Raspberry Pi GPS Module Interfacing.</li> <li>7.IoT based Web Controlled Home Automation using Raspberry Pi.</li> <li>8.Visitor monitoring with Raspberry Pi and Pi Camera.</li> <li>9.Interfacing Raspberry Pi with RFID.</li> <li>10.Building Google Assistant with Raspberry Pi.</li> <li>11.Installing Windows 10 IOT core on Raspberry Pi</li> <li>12.Working with Django on Raspberry Pi.</li> </ol>
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### **Evaluation Scheme**

**[B] Evaluation scheme for Practical courses-50 Marks**

<b>Course: SBIT403PR</b>	<b>Computer Oriented Numerical and Statistical Techniques Practical (Credits :2.5 Practicals/Week:01)</b>
	<ol style="list-style-type: none"> <li>1. Introduction of R <ol style="list-style-type: none"> <li>a. Using R execute the basic commands, array, list and frames.</li> <li>b. Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.</li> </ol> </li> <li>2. Perform data visualization using R</li> <li>3. Measures of Dispersion <ol style="list-style-type: none"> <li>a. Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range</li> <li>b. Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance</li> </ol> </li> <li>4. Distributions <ol style="list-style-type: none"> <li>a. Program for Uniform distribution.</li> <li>b. Program for Bernoulli distribution</li> <li>c. Program for Negative binomial distribution.</li> </ol> </li> <li>5. Using R import the data from Excel / .CSV file and draw the skewness.</li> <li>6. Import the data from Excel / .CSV and perform the hypothetical testing.</li> <li>7. Import the data from Excel / .CSV and perform the Chi-squared Test.</li> <li>8. Perform the Linear Regression using R.</li> <li>9. Computing the Least squares means using R.</li> <li>10. Compute the Linear Least Square Regression.</li> <li>11. Estimate Parameters of a Normal (Gaussian) Distribution in R</li> </ol>

#### **Evaluation Scheme**

**[B] Evaluation scheme for Practical courses-50 Marks.**

<b>Course: SBIT404PR</b>	<b>Practical Title: Software Methodologies and Management Practical</b> <b>(Credits : 02 Practicals/Week: 03)</b>
	<ol style="list-style-type: none"> <li>1. Use of tools and techniques for Research: methods to search required information effectively</li> <li>2. Reference Management Software like Zotero/ Mendeley</li> <li>3. Software for paper formatting like LaTeX/ MS Office.</li> <li>4. Software for detection of Plagiarism</li> <li>5. Understanding the standard format(IEEE etc) for writing a research paper.</li> <li>6. Selection of Topic/Domain and reference research papers</li> <li>7. Identifying the problem and reference research papers summary writing</li> <li>8. Research paper Abstract and Introduction writing</li> <li>9. Understanding Comparing methodologies/Algorithms/Techniques and Limitations in the Research</li> <li>10. Working on the Data collection (real time data - if applicable)</li> <li>11. Writing the Final Report</li> </ol>

**Evaluation Scheme**

**[B] Evaluation scheme for Practical courses-50 Marks**

<b>Course Code:</b> <b>SBIT405PR</b>	<b>Practical Title: Advanced Networks and Security Practical</b> <b>(Credits : 2.5 Practicals/Week: 03)</b>
	<ol style="list-style-type: none"> <li><b>1. Configuring OSPF –I</b> <ol style="list-style-type: none"> <li>a. Single-Area OSPF Link Costs and Interface Priorities</li> <li>b. Multi-Area OSPF with Stub Areas and Authentication</li> </ol> </li> <li><b>2. CONFIGURING OSPF –II</b> <ol style="list-style-type: none"> <li>a. OSPF Virtual Links and Area Summarization</li> <li>b. OSPF over Frame Relay</li> </ol> </li> <li><b>3. REDISTRIBUTION AND ADMINISTRATIVE DISTANCES</b> <ol style="list-style-type: none"> <li>a. Redistribution Between RIP and OSPF</li> <li>b. Manipulating Administrative Distances</li> </ol> </li> <li><b>4. BGP</b> <ol style="list-style-type: none"> <li>a. Configuring BGP with Default Routing</li> <li>b. Using the AS_PATH Attribute</li> <li>c. BGP Route Reflectors and Route Filters</li> </ol> </li> <li><b>5. CONFIGURE NAT SERVICES</b></li> <li><b>6. VLANS AND ETHERCHANNEL</b> <ol style="list-style-type: none"> <li>a. Static VLANS, VLAN Trunking, and VTP Domains and Modes</li> <li>b. Configuring EtherChannel</li> </ol> </li> <li><b>7. Layer 2 VLAN Security</b></li> <li><b>8. Configure Routers</b> <ol style="list-style-type: none"> <li>a. OSPF MD5 authentication.</li> <li>b. NTP.</li> <li>c. to log messages to the syslog server.</li> <li>d. to support SSH connections.</li> </ol> </li> <li><b>9. Configure AAA Authentication</b> <ol style="list-style-type: none"> <li>a. Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA</li> <li>b. Verify local AAA authentication from the Router console and the PC-A client</li> </ol> </li> <li><b>10. Configuring Extended ACLs</b> <ol style="list-style-type: none"> <li>a. Configure, Apply and Verify an Extended Numbered ACL</li> </ol> </li> </ol>

### Evaluation Scheme

**[B] Evaluation scheme for Practical courses-50 Marks**