

R.P. Gogate College of Arts & Science and  
R.V. Jogalekar College of Commerce  
(Autonomous), Ratnagiri



**Bachelor of Science  
In Information Technology  
(B.Sc. I.T.)**

Three Year Integrated Programme  
Six Semesters Course Structure  
Revised Scheme of Examination

Faculty of Science  
(Under-graduate Programme)

Choice Based Credit System (CBCS)  
**Academic Year- 2024-25**

## Scheme of Courses for T.Y.B.Sc. I.T.

<b>Semester – V</b>				
<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>	<b>No of lects/ week</b>
USIT501	Skill Enhancement Course	Software Project Management	2	5
USIT502	Skill Enhancement Course	Internet of Things	2	5
USIT503	Skill Enhancement Course	Advanced Web Programming	2	5
USIT504	Discipline Specific Elective (Any One)	Artificial Intelligence	2	5
USIT505		Linux System Administration		5
USIT506	Discipline Specific Elective (Any One)	Enterprise Java	2	3
USIT507		Next Generation Technologies		3
USIT5P1	Skill Enhancement Course Practical	Project Dissertation	2	3
USIT5P2	Skill Enhancement Course Practical	Internet of Things Practical	2	3
USIT5P3	Skill Enhancement Course Practical	Advanced Web Programming Practical	2	3
USIT5P4	Discipline Specific Elective Practical (Any One)*	Artificial Intelligence Practical	2	3
USIT5P5		Linux Administration Practical		3
USIT5P6	Discipline Specific Elective Practical (Any One)*	Enterprise Java Practical	2	3
USIT5P7		Next Generation Technologies Practical		
<b>Total Credits</b>			<b>20</b>	

<b>Semester – VI</b>				
<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>	<b>No of lects/ week</b>
USIT601	Skill Enhancement Course	Software Quality Assurance	2	5
USIT602	Skill Enhancement Course	Security in Computing	2	5
USIT603	Skill Enhancement Course	Business Intelligence	2	5
USIT604	Discipline Specific Elective (Any One)	Principles of Geographic Information Systems	2	5
USIT605		Enterprise Networking		5
USIT606	Discipline Specific Elective (Any One)	IT Service Management	2	3
USIT607		Cyber Laws		3
USIT6P1	Skill Enhancement Course Practical	Project Implementation	2	3
USIT6P2	Skill Enhancement Course Practical	Security in Computing Practical	2	3
USIT6P3	Skill Enhancement Course Practical	Business Intelligence Practical	2	3
USIT6P4	Discipline Specific Elective Practical (Any One)*	Principles of Geographic Information Systems Practical	2	3
USIT6P5		Enterprise Networking Practical		
USIT6P6	Skill Enhancement Course Practical	Advanced Mobile Programming	2	3
<b>Total Credits</b>			<b>20</b>	

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

# SEMESTER V

## Syllabus for T.Y.B.Sc.IT Autonomous from the year 2023-24

Name of the Course	<b>Software Project Management</b>
Course Code (refer to student handbook)	<b>USIT501</b>
Class	<b>T.Y.B.Sc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Core</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<p><b>Employability:</b> The demand for skilled software project managers is growing rapidly. As organizations continue to embrace technology and undertake software development projects, the need for professionals who can effectively manage these projects, teams, and resources becomes crucial. <b>Entrepreneurship:</b> Entrepreneurs in the software industry need strong project management skills to bring their ideas to life. They must be able to define project scopes, create realistic schedules, allocate resources, and manage risks effectively.</p> <p><b>Skill Development:</b> Software project management skills encompass defining project goals, creating work breakdown structures, estimating effort and resources, and scheduling tasks. Acquiring these skills helps individuals effectively plan and execute software projects.</p>

## Nomenclature: Software Project Management

### Course Outcomes:

On the successful completion of this course, the learner will be able to-

1. Proper understanding of Project Management Principles
2. Knowledge of Software Development Life Cycle (SDLC)
3. Create Project Plans
4. Team Management and Leadership Skills
5. Risk Assessment and Mitigation Problem Solutions
6. Thorough communication and Stakeholder Management

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Introduction to Software Project Management:	Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.	12
	Project Evaluation and Programme Management:	Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost-benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.	
	An Overview of Project Planning:	Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyze Project Characteristics, Step 4: Identify Project Products and Activities, Step5: 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	

II	Selection of an Appropriate Project Approach:	Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.	12
	Software Effort Estimation:	Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	
III	Activity Planning:	Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.	12
	Risk Management:	Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Countermeasures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.	
	Resource Allocation:	Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	

IV	Monitoring and Control:	Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project, Back to Target, Change Control, Software Configuration Management(SCM).	12
	Managing Contracts:	Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.	
	Managing People in Software Environments:	Introduction, Understanding Behaviour, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	
V	Working in Teams:	Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.	12
	Software Quality:	Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.	
	Project Closeout:	Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	

#### Learning Resources recommended:

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



## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks)	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
2. Descriptive type of questions, programming-based questions, problem solving / numerical based questions, single line answers, etc., will contain internal options.
3. Refer **appendix I** for Paper pattern.

Name of the Course	<b>Project Dissertation Practical</b>
Course Code (refer to student handbook)	<b>USIT5P1</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

**Nomenclature:** Project Dissertation Practical

**Course Outcomes:**

On the successful completion of this course, the learner will be able to

1. Understand the current state of the project management profession
2. Apply project management tools and techniques
3. Understand project management terminology.
4. Explore the appropriate methods to initiate, plan, execute, control and close projects

**Refer Appendix II**

**Evaluation Pattern**

**A. Continuous Internal Evaluation (20 Marks):**

Method	Marks
Project Documentation	10
Attendance and active participation in Laboratory	10

**B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):**

Question No	Unit	Marks
1	Project idea	05
2	Diagrams	05
3	Database and Normalization	05
4	Presentation	05
5	Documentation	05
6	Viva	05

Name of the Course	<b>Internet of Things</b>
Course Code (refer to student handbook)	<b>USIT502</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<p><b>Employability:</b>  <b>Increasing Demand:</b> The IoT has created a surge in demand for skilled professionals who can design, develop, and manage IoT systems. Industries such as manufacturing, healthcare, transportation, and smart cities require IoT experts to implement and maintain their connected devices.</p> <p><b>Entrepreneurship:</b>  <b>Innovation Opportunities:</b> IoT provides a fertile ground for entrepreneurs to develop innovative products and services. Entrepreneurs can leverage IoT technologies to create smart devices, automation solutions, and data-driven platforms.</p> <p><b>Start-up Ecosystem:</b> The IoT has fueled the growth of start-up ecosystems worldwide. Entrepreneurs can access resources such as funding, mentorship, and collaborative spaces focused on IoT innovation.</p>

## Nomenclature: Internet of Things

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand IoT Technology.
2. Gain Knowledge of designing principles.
3. Familiar with IoT Sensors and Actuators.
4. Design and Develop IoT Systems
5. Knowledge of IoT Security and Privacy
6. Know Ethical and Social Implications of IoT
7. Think from prototyping to manufacturing of IoT.

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	The Internet of Things: An Overview:	The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?	12
	Design Principles for Connected Devices:	Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, SmallPieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances.	
	Internet Principles:	Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	
II	Thinking About Prototyping:	Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some	
	Prototyping Embedded Devices:		

		Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	
III	Prototyping the Physical Design:	Preparation, Sketch, Iterate, and Explore, Non Digital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.	12
	Prototyping Online Components:	Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.	
IV	Techniques for Writing Embedded Code:	Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging.	12
	Business Models:	A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowd funding, Lean Startups.	
V	Moving to Manufacture:	What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, correctness and Maintainability, Security, Performance, User Community.	12
	Ethics:	Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.	

### Learning Resources recommended:

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

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks)	20
Assignments	10
Attendance and active participation in classroom	10

#### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
3. Refer **appendix I** for Paper pattern.

Name of the Course	<b>Internet of Things Practical</b>
Course Code (refer to student handbook)	<b>USIT5P2</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>



## Nomenclature: Internet of Things Practical

### Course Outcomes

Learner should be able to

1. Prepare and make use of embedded development platforms.
2. Interface various sensors and actuators with a development platform.
3. Design and Develop IoT Systems.

### Curriculum:

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

This is sample Practical list. Course instructor may change the practical as per syllabus.

**Learning Resources recommended:**

<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Getting Started with the Internet of Things	Cuno Pfister	O'Reilly	Sixth	2018
2.	Getting Started with Raspberry Pi	Matt Richardson and Shawn Wallace	SPD	Third	2016

**Evaluation Pattern****A. Continuous Internal Evaluation (20 Marks):**

<b>Method</b>	<b>Marks</b>
Certified Journal	10
Attendance and active participation in Laboratory	10

**B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):**

<b>Question No</b>	<b>Unit</b>	<b>Marks</b>
1	Program 1	10
2	Program 2	15
3	Viva	05

Name of the Course	<b>Advanced Web Programming</b>
Course Code (refer to student handbook)	<b>USIT503</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<p><b>Employability:</b> There is a continuous demand for professionals with advanced web programming skills due to the increasing reliance on web-based applications and services. Employers seek individuals who can develop complex and interactive web solutions using advanced programming languages and frameworks.</p> <p><b>Specialized Roles:</b> Advanced web programming opens up opportunities for specialized roles such as full-stack developers, front-end developers, back-end developers, and web application architects. <b>Entrepreneurship:</b> Advanced web programming skills empower entrepreneurs to create innovative and customized web solutions for their businesses or clients. By leveraging cutting-edge technologies and frameworks, entrepreneurs can develop unique web applications tailored to specific needs.</p>

## Nomenclature: Advanced Web Programming

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Be proficient in Advanced Web Technologies.
2. Be Advanced Front-End Developer Skills.
3. Be Back-End Developer.
4. Be a Full-Stack Web Developer.
5. Integration Third-Party APIs and Services.
6. Test and Debug Web Applications.
7. Do Web Application Security.
8. Have Performance Optimization and Web Analytics.
9. Perform Collaboration and Project Management Skills.

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Introducing .NET:	The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.	12
	The C# Language:	C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.	
	Types, Objects, and Namespaces:	The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	
II	Web Form Fundamentals:	Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.	12
	Form Controls:	Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	

III	Error Handling, Logging, and Tracing:	Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing	12
	State Management:	Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options	
	Styles, Themes, and Master pages:	Styles, Themes, Master Page Basics, Advanced Master Pages,	
IV	ADO.NET Fundamentals:	Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.	12
	Data Binding:	Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,	
	The Data Controls:	The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView	
V	XML:	XML Explained, The XML Classes, XML Validation, XML Display and Transforms.	12
	Security Fundamentals:	Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.	
	ASP.NET AJAX:	Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.	

### Learning Resources recommended:

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

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

**B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):**

<b>Question No</b>	<b>Unit</b>	<b>Marks</b>
<b>1</b>	<b>I</b>	<b>12</b>
<b>2</b>	<b>II</b>	<b>12</b>
<b>3</b>	<b>III</b>	<b>12</b>
<b>4</b>	<b>IV</b>	<b>12</b>
<b>5</b>	<b>V</b>	<b>12</b>

**Guidelines for paper pattern for Semester End Evaluation:**

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Advanced Web Programming Practical</b>
Course Code (refer to student handbook)	<b>USIT5P3</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<p><b>employability/ entrepreneurship/ skill development</b></p> <p><b>Entrepreneurship:</b></p> <p><b>E-commerce and Online Services: With the growing dominance of e-commerce and online services, entrepreneurs with advanced web programming skills can build feature-rich online stores, payment gateways, booking platforms, and other web-based services. This opens up opportunities to monetize digital products and create scalable online businesses.</b></p>



## Nomenclature: Advanced Web Programming Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Be proficient in Advanced Web Technologies.
2. Be Advanced Front-End Developer Skills.
3. Be Back-End Developer.
4. Be a Full-Stack Web Developer.
5. Integration Third-Party APIs and Services.
6. Test and Debug Web Applications.
7. Do Web Application Security.
8. Have Performance Optimization and Web Analytics.
9. Perform Collaboration and Project Management Skills.

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1: Working with basic C# and ASP .NET	<ol style="list-style-type: none"><li>a. Create an application that obtains four int values from the user and displays the product.</li><li>b. Create an application to demonstrate string operations.</li><li>c. Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.</li><li>d. Create an application to demonstrate following operations<ol style="list-style-type: none"><li>i. Generate Fibonacci series.</li><li>ii. Test for prime numbers.</li><li>iii. Test for vowels.</li><li>iv. Use of foreach loop with arrays</li><li>v. Reverse a number and find sum of digits of a number.</li></ol></li></ol>	3
2	Practical 2: Working with Object Oriented C# and ASP .NET	<ol style="list-style-type: none"><li>a. Create simple application to perform following operations<ol style="list-style-type: none"><li>i. Finding factorial Value</li><li>ii. Money Conversion</li><li>iii. Quadratic Equation</li><li>iv. Temperature Conversion</li></ol></li><li>b. Create simple application to demonstrate use of following concepts<ol 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></ol></li><li>c. Create simple application to demonstrate use of</li></ol>	3

		<p>following concepts</p> <p>i. Using Delegates and events ii. Exception handling</p>	
3	Practical 3: Working with Web Forms and Controls	<p>a. Create a simple web page with various server controls to demonstrate setting and use of their properties. (Example : AutoPostBack)</p> <p>b. Demonstrate the use of Calendar control to perform following operations.</p> <p>a) Display messages in a calendar control b) Display vacation in a calendar control</p> <p>c) Selected day in a calendar control using style d) Difference between two calendar dates</p> <p>c. Demonstrate the use of Treeview control perform following operations.</p> <p>a) Treeview control and datalist b) Treeview operations</p>	3
4	Practical 4: Working with Form Controls	<p>a. Create a Registration form to demonstrate use of various Validation controls.</p> <p>b. Create Web Form to demonstrate use of Adrotator Control.</p> <p>c. Create Web Form to demonstrate use User Control.</p>	3
5	Practical 5: Working with Navigation, Beautification and Master page.	<p>a. Create Web Form to demonstrate use of Website Navigation controls and Site Map.</p> <p>b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.</p> <p>c. Create a web application to demonstrate various states of ASP.NET Pages.</p>	3
6	Practical 6: Working with Database	<p>a. Create a web application bind data in a multiline textbox by querying in another textbox.</p> <p>b. Create a web application to display records by using database.</p> <p>c. Demonstrate the use of Datalist link control.</p>	3
7	Practical 7: Working with Database	<p>a. Create a web application to display Databinding using dropdownlist control.</p> <p>b. Create a web application for to display the phone no of an author using database.</p> <p>c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).</p>	3

8	Practical 8: Working with data controls	a. Create a web application to demonstrate various uses and properties of SqlDataSource. b. Create a web application to demonstrate data binding using DetailsView and FormView Control. c. Create a web application to display Using Disconnected Data Access and Databinding using GridView.	3
9	Practical 9 Working with GridView control	a. Create a web application to demonstrate use of GridView control template and GridView hyperlink. b. Create a web application to demonstrate use of GridView button column and GridView events. c. Create a web application to demonstrate GridView paging and Creating own table format using GridView.	3
10	Practical 10 Working with AJAX and XML	a. Create a web application to demonstrate reading and writing operations with XML. b. Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties. c. Create a web application to demonstrate use of various Ajax controls.	3
11	Practical 11 Programs to create and use DLL	Programs to create and use DLL	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015	Anne Bohem and Joel Murach	Murach	Third	2016
3.	Murach's ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
4.	ASP.NET 4.0 programming	J. Kanjilal	Tata McGraw-Hill		2011

## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

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Name of the Course	<b>Artificial Intelligence</b>
Course Code (refer to student handbook)	<b>USIT504</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Discipline Specific Elective</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Artificial Intelligence

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Know History of AI
2. Solve Problems and Design Algorithms.
3. Understand Machine Learning Techniques
4. Basics of AI Programming.
5. Have Knowledge of Ethical and Social Implications.
6. Aware about Current Trends and Future Directions.

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	<b>Introduction:</b>	What is Artificial Intelligence? Foundations of AI, history, the state of art AI today.	12
	<b>Intelligent Agents:</b>	agents and environment, good behavior, nature of environment, the structure of agents.	
II	<b>Solving Problems by Searching:</b>	Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions.	12
	<b>Beyond Classical Search:</b>	local search algorithms, searching with non-deterministic action, searching with partial observations, online search agents and unknown environments.	
III	<b>Adversarial Search:</b>	Games, optimal decisions in games, alpha-beta pruning, stochastic games, partially observable games, state-of-the-art game programs.	12
	<b>Logical Agents:</b>	Knowledge base agents, The Wumpus world, logic, propositional logic, propositional theorem proving, effective propositional model checking, agents based on propositional logic.	
IV	<b>First Order Logic:</b>	Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic.	12
	<b>Inference in First Order Logic:</b>	propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.	

V	<b>Planning:</b>	Definition of Classical Planning, Algorithms for planning as state space search, planning graphs, other classical planning approaches, analysis of planning approaches, Time, Schedules and resources, hierarchical planning, Planning and Acting in Nondeterministic Domains, multiagent planning,	12
	<b>Knowledge Representation:</b>	Categories and Objects, events, mental events and objects, reasoning systems for categories, reasoning with default information, Internet shopping world	

### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	3rd	2015
2	A First Course in Artificial Intelligence	Deepak Khemani	TMH	First	2017
3	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff publishers	1st	2018
4	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar Nair	TMH	3rd	2009
5	Artificial Intelligence & Soft Computing for Beginners	Anandita Das Bhattacharjee	SPD	1st	2013

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks)	20
Assignments	10
Attendance and active participation in classroom	10

**B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):**

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

**Guidelines for paper pattern for Semester End Evaluation:**

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Artificial Intelligence Practical</b>
Course Code (refer to student handbook)	<b>USIT5P4</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Discipline Specific Elective</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Artificial Intelligence Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

- Understand AI Fundamentals
- Have Problem Solving and Algorithm Design Skills
- Generate Machine Learning Techniques
- Develop AI Programming
- Solve Ethical and Social Implications
- Have AI System Development Skills
- Focus on Current Trends and Future Directions

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1	a Write a program to implement depth first search algorithm. b Write a program to implement breadth first search algorithm.	3
2	Practical 2	a .Write a program to simulate 4-Queen / N-Queen problem. b Write a program to solve tower of Hanoi problem.	3
3	Practical 3	a. Write a program to implement alpha beta search. b Write a program for Hill climbing problem.	3
4	Practical 4	a Write a program to implement A* algorithm. b Write a program to implement AO* algorithm.	3
5	Practical 5	a Write a program to solve water jug problem. b Design the simulation of tic – tac – toe game using min-max algorithm.	3
6	Practical 6	a Write a program to solve Missionaries and Cannibals problem. b Design an application to simulate number puzzle problem.	3

7	Practical 7	a Write a program to shuffle Deck of cards. b Solve traveling salesman problem using artificial intelligence technique.	3
8	Practical 8	a Solve the block of World problem. b Solve constraint satisfaction problem	3
9	Practical 9	a Derive the expressions based on Associative law b Derive the expressions based on Distributive law	3
10	Practical 10	a Write a program to derive the predicate. (for e.g.: Sachin is batsman , batsman is cricketer) - > Sachin is Cricketer. b Write a program which contains three predicates: male, female, parent. Make rules for following family relations: father, mother, grandfather, grandmother, brother, sister, uncle, aunt, nephew and niece, cousin. Question: i. Draw Family Tree. ii. Define: Clauses, Facts, Predicates and Rules with conjunction and disjunction	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	3rd	2015
2	A First Course in Artificial Intelligence	Deepak Khemani	TMH	First	2017
3	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff publishers	1st	2018

## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

Name of the Course	<b>Linux System Administration</b>
Course Code (refer to student handbook)	USIT505
Class	T.Y.BSc.IT
Semester	V
No of Credits	2
Nature	Theory
Type (applicable to NEP only)	Discipline Specific Elective
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

## Nomenclature: Linux System Administration

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Linux Operating System
2. Gain knowledge of Installation and Configuration
3. Do System Maintenance and Updates
4. Have User and Group Management
5. Do Networking and Security Tasks
6. Perform System Monitoring and Performance Tuning
7. Troubleshoot and Resolve Problems.

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Introduction to Red Hat Enterprise Linux:	Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.	12
	Command Line:	Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files	
	System Administration Tasks:	Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System	
	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	

II	Configuring and Managing Storage:	Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes	12
	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, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access	
	Working with Users, Groups, and Permissions:	Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	
III	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	12
	Setting Up Cryptographic Services:	Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys,	

		Encrypting Files with GPG, GPG Signing, Signing RPM Files	
	Configuring Server for File Sharing:	What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.	
IV	Configuring DNS and DHCP:	Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server	12
	Setting Up a Mail Server:	Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP	
	Configuring Apache on Red Hat Enterprise Linux:	Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL	
V	Introducing Bash Shell Scripting:	Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.	12
	High-Availability Clustering:	High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the	



		Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems	
	Setting Up an Installation Server:	Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, 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	

### Learning Resources recommended:

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

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Linux Administration Practical</b>
Course Code (refer to student handbook)	<b>USIT5P5</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Discipline Specific Elective</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Linux Administration Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Linux Operating System
2. Gain knowledge of Installation and Configuration
3. Do System Maintenance and Updates
4. Have User and Group Management
5. Do Networking and Security Tasks
6. Perform System Monitoring and Performance Tuning
7. Troubleshoot and Resolve Problems.

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 0	Installation of RHEL 6.X	3
2	Practical 1	Graphical User Interface and Command Line Interface and Processes a Exploring the Graphical Desktop b The Command Line Interface c Managing Processes	3
3	Practical 2	Storage Devices and Links, Backup and Repository b Working with Storage Devices and Links a Making a Backup b Creating a Repository	3
4	Practical 3	Working with RPMsm Storage and Networking a Using Query Options b Extracting Files From RPMs c Configuring and Managing Storage d Connecting to the Network	3
5	Practical 4	Working with Users, Groups, and Permissions	3
6	Practical 5	Firewall and Cryptographic services a Securing Server with iptables b Setting Up Cryptographic Services	3
7	Practical 6	Configuring Server for File Sharing a Configuring NFS Server and Client b Configuring Samba c Configuring FTP	3

8	Practical 7	DNS, DHCP and Mail Server a Configuring DNS b Configuring DHCP c Setting Up a Mail Server	3
9	Practical 8	Web Server a Configuring Apache on Red Hat Enterprise Linux b Writing a Script to Monitor Activity on the Apache Web Server c Using the select Command	3
10	Practical 9	Shell Scripts and High-Availability Clustering a Writing Shell Scripts b Configuring Booting with GRUB c Configuring High Availability Clustering	3
11	Practical 10	Setting Up an Installation Server a Configuring Network Server as an Installation Server b Setting Up a TFTP and DHCP Server for PXE Boot	

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

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

## Evaluation Pattern

### A. Internal Evaluation

#### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

#### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

Name of the Course	<b>Enterprise Java</b>
Course Code (refer to student handbook)	USIT506
Class	T.Y.B.Sc.IT
Semester	V
No of Credits	2
Nature	<b>Theory</b>
Type (applicable to NEP only)	Discipline Specific Elective
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

## Nomenclature: Enterprise Java

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Java Enterprise Edition (Java EE)
2. Develop enterprise-level applications
3. Master Java EE APIs
4. Implement database connectivity
5. Build user interfaces
6. Deploy and manage Java EE applications

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Understanding Java EE	What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server	12
	Java EE Architecture, Server and Containers	Types of System Architecture, Java EE Server, Java EE Containers.	
	Introduction to Java Servlets	The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do?	
	Servlet API and Lifecycle	Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet	
	Working with Servlets	Getting Started, Using Annotations Instead of Deployment Descriptor.	
	Working with Databases	What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	
II	Request Dispatcher	Requestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application.	12
	COOKIES	Kinds of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing the Colors of A Page	



	SESSION	What Are Sessions? Lifecycle of Http Session, Session Tracking With Servlet API, A Servlet Session Example	
	Working with Files	Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application.	
	Working with Non-Blocking I/O	Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp	
III	Introduction To Java Server Pages	Why use Java Server Pages? Disadvantages Of JSP, JSP v\vs Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages	
	Getting Started With Java Server Pages	Comments, JSP Document, JSP Elements, JSP GUI Example.	
	Action Elements	Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean.	
	Implicit Objects, Scope and El Expressions	Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language.	
	Java Server Pages Standard Tag Libraries	What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.	
IV	Introduction To Enterprise Javabeans	Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans	12
	Working with Session Beans	When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.	
	Working with Message Driven Beans	Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.	

	Interceptors	Request and Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.	
	Java Naming and Directory Interface	What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE.	
V	Persistence, Object/Relational Mapping And JPA	What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping	12
	Introduction to Java Persistence API	The Java Persistence API, JPA, ORM, Database and the application, Architecture of JPA, How JPA Works? JPA Specifications.	
	Writing JPA Application	Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabeen Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running the JPA Application.	
	Introduction to Hibernate	What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?	
	Writing Hibernate Application	Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabeen Class, Creating Hibernate Configuration File, Adding a Mapping Class,Creating JSPS, Running The Hibernate Application.	

### Learning Resources recommended:

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

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

#### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
3. Refer **appendix I** for Paper pattern.

Name of the Course	<b>Enterprise Java Practical</b>
Course Code (refer to student handbook)	<b>USIT5P6</b>
Class	<b>T.Y.B.Sc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	Discipline Specific Elective
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Enterprise Java Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

- Understand Java Enterprise Edition (Java EE)
- Develop enterprise-level applications
- Master Java EE APIs
- Implement database connectivity
- Build user interfaces
- Deploy and manage Java EE applications

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	<b>Practical 1:</b> 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.	3+3
II	<b>Practical 2:</b> Implement the following Servlet applications with Cookies and Sessions.	a. Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed. b. Create a servlet that uses Cookies to store the number of times a user has visited servlet. c. Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.	3+3

II	<b>Practical 3:</b> Implement the Servlet IO and File applications.	a. Create a Servlet application to upload and download a file. b. Develop Simple Servlet Question Answer Application using Database. c. Create simple Servlet application to demonstrate Non-Blocking Read Operation.	3+3
III	<b>Practical 4:</b> 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.	3+3+3
III	<b>Practical 5:</b> 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.	3+3+3
IV	<b>Practical 6:</b> Implement the following EJB Applications.	a. Create a Currency Converter application using EJB. b. Develop a Simple Room Reservation System Application Using EJB. c. Develop simple shopping cart application using EJB [Stateful Session Bean].	3+3
IV	<b>Practical 7:</b> Implement the following EJB applications with different types of Beans.	a. Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans. b. Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean]. c. Develop simple Marks Entry Application to demonstrate accessing Database using EJB.	3+3+3
V	<b>Practical 8:</b> 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.	3+3

V	<b>Practical 9:</b> Implement the following JPA applications with ORM and Hibernate.	a. Develop a JPA Application to demonstrate use of ORM associations. b. Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database. c. Develop a Hibernate application to store and retrieve employee details in MySQL Database.	3+3+3
V	<b>Practical 10:</b> Implement the following Hibernate applications.	a. Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation. b. Develop Hibernate application to enter and retrieve course details with ORM Mapping. c. Develop a five page web application site using any two or three Java EE Technologies.	3+3+3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1	Java EE 7 For Beginners	Sharanam Shah, Vaishali Shah	SPD	First	2017
2	Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development	Elder Moraes	Packt	First	2018

## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

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Name of the Course	<b>Next Generation Technologies</b>
Course Code (refer to student handbook)	<b>USIT507</b>
Class	<b>T.Y.B.Sc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Next Generation Technologies

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand emerging technologies
2. Analyze the impact of next-generation technologies
3. Explore applications of emerging technologies
4. Identify business opportunities
5. Stay updated on emerging trends

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Big Data:	Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies	12
	NoSQL:	SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases	
	Introducing MongoDB:	History, MongoDB Design Philosophy, Speed, Scalability, and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison	
II	The MongoDB Data Model:	The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object-Oriented Programming, Schema Evolution	12
	Using MongoDB Shell:	Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application's Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach	

	MongoDB Architecture :	Core Processes, mongod, mongo, mongos, MongoDB Tools, Standalone Deployment, Replication, Master/Slave Replication, Replica Set, Implementing Advanced Clustering with Replica Sets, Sharding, Sharding Components, Data Distribution Process, Data Balancing Process, Operations, Implementing Sharding, Controlling Collection Distribution (Tag-Based Sharding), Points to Remember When Importing Data in a Sharded Environment, Monitoring for Sharding, Monitoring the Config Servers, Production Cluster Architecture, Scenario 1, Scenario 2, Scenario 3, Scenario 4	
III	MongoDB Storage Engine:	Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS, GridFS under the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations	12
	MongoDB Use Cases:	Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding	
	MongoDB Limitations:	MongoDB Space Is Too Large (Applicable for MMAPv1), Memory Issues (Applicable for Storage Engine MMAPv1), 32-bit vs. 64-bit, BSON Documents, Namespaces Limits, Indexes Limit, Capped Collections Limit - Maximum Number of Documents in a Capped Collection, Sharding Limitations, Shard Early to Avoid Any Issues, Shard Key Can't Be Updated, Shard Collection Limit, Select the Correct Shard Key, Security Limitations, No Authentication by Default, Traffic to and from MongoDB Isn't Encrypted, Write and Read Limitations, Case-Sensitive Queries, Type-Sensitive Fields, No JOIN, Transactions, MongoDB Not Applicable Range	
	MongoDB Best Practices:	Deployment, Hardware Suggestions from the MongoDB Site, Few Points to be Noted, Coding, Application Response Time Optimization, Data Safety, Administration, Replication Lag, Sharding, Monitoring	
IV	The End of Disk? SSD and In-Memory Databases:	The End of Disk?, Solid State Disk, The Economics of Disk, SSD-Enabled Databases, In-Memory Databases, TimesTen, Redis, SAP HANA, VoltDB, Oracle 12c "in-Memory Database, Berkeley Analytics Data Stack and Spark, Spark Architecture	12

	jQuery:	Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider	
V	JSON:	Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange, JSON PHP, JSON HTML, JSONP	12

### Learning Resources recommended:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1	Practical MongoDB	Shakuntala Gupta Edward Navin Sabharwal	Apress		
2	Beginning jQuery	Jack Franklin Russ Ferguson	Apress	Second	
3	Next Generation Databases	Guy Harrison	Apress		
4	Beginning JSON	Ben Smith	Apress		

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

**B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):**

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

**Guidelines for paper pattern for Semester End Evaluation:**

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Next Generation Technologies Practical</b>
Course Code (refer to student handbook)	<b>USIT5P7</b>
Class	<b>T.Y.B.Sc.IT</b>
Semester	<b>V</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Elective</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Next Generation Technologies Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Explore and experiment with emerging technologies and innovations.
2. Develop practical applications utilizing cutting-edge technologies.
3. Analyze the potential impact of next-gen technologies on various industries.
4. Collaborate on projects to address real-world challenges using these technologies.
5. Demonstrate adaptability and readiness for future advancements in technology.

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1 MongoDB Basics	a Write a MongoDB query to create and drop database. b Write a MongoDB query to create, display and drop collection c Write a MongoDB query to insert, query, update and delete a document.	3
2	Practical 2	Simple Queries with MongoDB	3
3	Practical 3 Implementing Aggregation	a Write a MongoDB query to use sum, avg, min and max expression. b Write a MongoDB query to use push and addToSet expression. c Write a MongoDB query to use first and last expression.	3+3
4	Practical 4 Replication, Backup and Restore	a Write a MongoDB query to create Replica of existing database. b Write a MongoDB query to create a backup of existing database. c Write a MongoDB query to restore database from the backup.	3+3
5	Practical 5 Java and MongoDB	a Connecting Java with MongoDB and inserting, retrieving, updating and deleting.	3
6	Practical 6 PHP and MongoDB	a Connecting PHP with MongoDB and inserting, retrieving, updating and deleting.	3

7	Practical 7 Python and MongoDB	a Connecting Python with MongoDB and inserting, retrieving, updating and deleting.	3
8	Practical 8 Programs on Basic jQuery	a jQuery Basic, jQuery Events b jQuery Selectors, jQuery Hide and Show effects c jQuery fading effects, jQuery Sliding effects	3
9	Practical 9 jQuery Advanced	a jQuery Animation effects, jQuery Chaining b jQuery Callback, jQuery Get and Set Contents c jQuery Insert Content, jQuery Remove Elements and Attribute	3
10	Practical 10 JSON	a Creating JSON b Parsing JSON c Persisting JSON	3
11	Practical 11 Create a JSON file and import it to MongoDB	a Export MongoDB to JSON. b Write a MongoDB query to delete JSON object from MongoDB	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

### Learning Resources recommended:

### Evaluation Pattern

#### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

#### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05



# SEMESTER VI

Name of the Course	<b>Software Quality Assurance</b>
Course Code (refer to student handbook)	<b>USIT601</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	employability/ entrepreneurship/ skill development

## Nomenclature: Software Quality Assurance

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand of Software Quality Assurance (SQA) Principles
2. Gain Knowledge of SQA Processes and Methodologies
3. Achieve Proficiency in Test Planning and Test Design
4. Compete in Test Execution and Defect Management
5. Solve Problems and Analytical Skills.
6. Aware about Emerging Trends and Technologies

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Introduction to Quality:	Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.	12
	Software Quality:	Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.	
II	Fundamentals of testing:	Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing,	12

		Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	
III	Unit Testing: Boundary Value Testing:	Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing	12
	Equivalence Class Testing:	Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations.	
	Table-Based Testing:	Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations	
	Path Testing:	Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations	
	Data Flow Testing:	Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	
IV	Software Verification and Validation:	Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.	
	V-test Model:	Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during	

		design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.	
V	Levels of Testing:	Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.	12
	Special Tests:	Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.	

### Learning Resources recommended:

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

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **Appendix I** for Paper pattern.
-

Name of the Course	<b>Project Implementation Practical</b>
Course Code (refer to student handbook)	<b>USIT6P1</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

**Nomenclature:** Project Implementation**Course Outcomes:**

On the successful completion of this course, the learner will be able to

1. Understand the current state of the project management profession
2. Apply project management tools and techniques
3. Understand project management terminology.
4. Explore the appropriate methods to initiate, plan, execute, control and close projects

**Refer Appendix II****Evaluation Pattern****A. Continuous Internal Evaluation (20 Marks):**

Method	Marks
Project Documentation	10
Attendance and active participation in Laboratory	10

**B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):**

Question No	Unit	Marks
1	Documentation & Content Presentation	05
2	Problem Definition, Solutions Provided, Charts, Diagram, Planning and Methodology	05
3	Presentation Skills	05
4	Working and Functionality Testing	05
5	Successful Execution	05
6	Viva	05



Name of the Course	<b>Security in Computing</b>
Course Code (refer to student handbook)	<b>USIT602</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

## Nomenclature: Security in Computing

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Computer Security Concepts
2. Gain Knowledge of Security Policies and Standards
3. Proficiency in Secure System Design
4. Understand the concepts of Cryptography
5. Have awareness of Malware and Intrusion Detection
6. Understand Incident Response and Disaster Recovery
7. Do Ethical and Legal Considerations

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Information Security Overview:	The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.	12
	Risk Analysis:	Threat Definition, Types of Attacks, Risk Analysis.	
	Secure Design Principles:	The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	
II	Authentication and Authorization:	Authentication, Authorization	12
	Encryption:	A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.	
	Storage Security:	Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.	
	Database Security:	General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup	

		and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring	
III	Secure Network Design:	Introduction to Secure Network Design, Performance, Availability, Security	12
	Network Device Security:	Switch and Router Basics, Network Hardening.	
	Firewalls:	Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.	
	Wireless Network Security:	Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	
IV	Intrusion Detection and Prevention Systems:	IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).	12
	Voice over IP (VoIP) and PBX Security:	Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.	
	Operating System Security Models:	Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	
V	Virtual Machines and Cloud Computing:	Virtual Machines, Cloud Computing.	12
	Secure Application Design:	Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.	
	Physical Security:	Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.	

### Learning Resources recommended:

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

### Evaluation Pattern

#### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

#### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
3. Refer **appendix I** for Paper pattern.

Name of the Course	<b>Security in Computing Practical</b>
Course Code (refer to student handbook)	<b>USIT6P2</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Security in Computing Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Computer Security Concepts
2. Gain Knowledge of Security Policies and Standards
3. Proficiency in Secure System Design
4. Understand the concepts of Cryptography
5. Have awareness of Malware and Intrusion Detection
6. Understand Incident Response and Disaster Recovery
7. Do Ethical and Legal Considerations

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1	Configure Routers a OSPF MD5 authentication. b NTP. c to log messages to the syslog server. d to support SSH connections.	3
2	Practical 2	Configure AAA Authentication a Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA b Verify local AAA authentication from the Router console and the PC-A client	3+3
3	Practical 3	Configuring Extended ACLs a Configure, Apply and Verify an Extended Numbered ACL	3+3
4	Practical 4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs a Verify connectivity among devices before firewall configuration. b Use ACLs to ensure remote access to the routers is available only from management station PC-C. c Configure ACLs on to mitigate attacks. d Configuring IPv6 ACLs	3+3
5	Practical 5	Configuring a Zone-Based Policy Firewall	3

6	Practical 6	Configure IOS Intrusion Prevention System (IPS) Using the CLI a Enable IOS IPS. b Modify an IPS signature.	3
7	Practical 7	Layer 2 Security a Assign the Central switch as the root bridge. b Secure spanning-tree parameters to prevent STP manipulation attacks. c Enable port security to prevent CAM table overflow attacks.	3
8	Practical 8	Layer 2 VLAN Security	3
9	Practical 9	Configure and Verify a Site-to-Site IPsec VPN Using CLI	3
10	Practical 10	Configuring ASA Basic Settings and Firewall Using CLI a Configure basic ASA settings and interface security levels using CLI b Configure routing, address translation, and inspection policy using CLI c Configure DHCP, AAA, and SSH d Configure a DMZ, Static NAT, and ACLs	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Complete Reference: Information Security	Mark hodes-Ousley	McGraw-Hill	2nd	2013
2.	Essential Cybersecurity Science	Josiah Dykstra	O'Reilly	Fifth	2017

## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

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Name of the Course	<b>Business Intelligence</b>
Course Code (refer to student handbook)	<b>USIT603</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	<b>Skill Enhancement Course</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Business Intelligence

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Business Intelligence Concepts
2. Have Knowledge of Data Warehousing
3. Be Proficient in Data Analysis
4. Understand Data Visualization:
5. Do Data-driven Decision Making
6. Make Critical Thinking and Problem-Solving

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Business intelligence:	Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence	12
	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	
II	Mathematical models for decision making:	Structure of mathematical models, Development of a model, Classes of models	12
	Data mining:	Definition of data mining, Representation of input data ,Data mining process, Analysis methodologies	
	Data preparation:	Data validation, Data transformation, Data reduction	
III	Classification:	Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines	
	Clustering:	Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	

IV	Business intelligence applications: Marketing models:	Relational marketing, Sales force management,	12
	Logistic and production models:	Supply chain optimization, Optimization models for logistics planning, Revenue management systems.	
	Data envelopment analysis:	Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	
V	Knowledge Management:	Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management	12
	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	

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Vercellis	Wiley	First	2009
2.	Decision support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Dursun Delen	Pearson	Ninth	2011
3.	Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	First	2015

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks)	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

#### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Business Intelligence Practical</b>
Course Code (refer to student handbook)	<b>USIT6P3</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Business Intelligence Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understanding Business Intelligence
2. Have Knowledge of Data Warehousing
3. Be Proficient in Data Analysis
4. Understand Data Visualization:
5. Do Data-driven Decision Making
6. Make Critical Thinking and Problem-Solving

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1	Import the legacy data from different sources such as ( Excel , SqlServer, Oracle etc.) and load in the target system. ( You can download sample database such as Adventureworks, Northwind, foodmart etc.)	3
2	Practical 2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	3+3
3	Practical 3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.	3+3
4	Practical 4	a. Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.	3+3
5	Practical 5	a. Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.	3

6	Practical 6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	3
7	Practical 7	Perform the data classification using classification algorithm.	3
8	Practical 8	Perform the data clustering using clustering algorithm.	3
9	Practical 9	Perform the Linear regression on the given data warehouse data.	3
10	Practical 10	Perform the logistic regression on the given data warehouse data.	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Vercellis	Wiley	First	2009
2.	Decision support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Dursun Delen	Pearson	Ninth	2011
3.	Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	First	2015

## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

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Name of the Course	<b>Principles of Geographic Information Systems</b>
Course Code (refer to student handbook)	<b>USIT604</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Principles of Geographic Information Systems

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand the fundamentals of Geographic Information Systems (GIS)
2. Proficiency in GIS software
3. Data acquisition and manipulation
4. Do Spatial analysis and modeling
5. Perform Cartographic visualization
6. Do Data querying and attribute management
7. Do Project design and implementation
8. Have Ethical and legal considerations

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	A Gentle Introduction to GIS: The nature of GIS:	Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.	12
	The real world and representations of it:	Models and modelling, Maps, Databases, Spatial databases and spatial analysis	
	Models and Representations of the real world Geographic Phenomena	Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries	
	Computer Representations of Geographic Information:	Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects, Organizing and Managing Spatial Data The Temporal Dimension	
II	Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems:	GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)	12

	Stages of Spatial Data handling:	Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.	
	Database management Systems:	Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database.	
	GIS and Spatial Databases:	Linking GIS and DBMS, Spatial database functionality.	
III	Spatial Referencing and Positioning Spatial Referencing:	Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations	12
	Data Entry and Preparation Spatial Data Input:	Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere	
	Data Quality:	Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency	
	Data Preparation:	Data checks and repairs, Combining data from multiple sources	
	Point Data Transformation:	Interpolating discrete data, Interpolating continuous data	
IV	Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement:	Measurement, Spatial selection queries, Classification	12
	Overlay functions:	Vector overlay operators, Raster overlay operators	
	Neighbourhood functions:	Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis	
	Analysis:	Network analysis, interpolation, terrain modeling	
	GIS and Application models:	GPS, Open GIS Standards, GIS Applications and Advances	

	Error Propagation in spatial data processing:	How Errors propagate, Quantifying error propagation	
V	Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox	What kind of data do I have? How can I map my data?	12
	How to map?	How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series, Map Cosmetics, Map Dissemination	

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Principles of Geographic Information Systems An Introductory Text Book	Editors: Otto Huisman and Rolf A.	The International Institute of Geoinformation Science and Earth Observation	Fourth	2009
2.	Principles of Geographic Information Systems	P.A Burrough and R.A.McDonnell	Oxford University Press	Third	1999
3.	Fundamentals of Spatial Information Systems,	R.Laurini and D. Thompson,	Academic Press		1994
4.	Fundamentals of Geographic Information Systems	Michael N.Demers	Wiley Publications	Fourth	2009
5.	Introduction to Geographic Information Systems	Chang Kang-tsung (Karl),	McGrawHill	Any above 3 <sup>rd</sup>	2013 7 <sup>th</sup> Edition

				Edition	
6.	GIS Fundamentals: A First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5 <sup>th</sup> Edition	

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

### Guidelines for paper pattern for Semester End Evaluation:

- All questions will be compulsory.
- Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
- Refer **appendix I** for Paper pattern.

Name of the Course	<b>Principles of Geographic Information Systems Practical</b>
Course Code (refer to student handbook)	<b>USIT6P4</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Principles of Geographic Information Systems Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand the fundamentals of Geographic Information Systems (GIS)
2. Proficiency in GIS software
3. Data acquisition and manipulation
4. Do Spatial analysis and modeling
5. Perform Cartographic visualization
6. Do Data querying and attribute management
7. Do Project design and implementation
8. Have Ethical and legal considerations

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.	3
2	Practical 2	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics	3
3	Practical 3	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping	3
4	Practical 4	Working with attributes, terrain Data	3
5	Practical 5	Working with Projections and WMS Data	3
6	Practical 6	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data	3
7	Practical 7	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries	3
8	Practical 8	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data	3

9	Practical 9	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas	3
10	Practical 10	Validating Map data	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

### Learning Resources recommended:

1. <https://www.esri.com>
2. <https://www.gislounge.com>

### Evaluation Pattern

#### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

#### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05



Name of the Course	<b>Enterprise Networking</b>
Course Code (refer to student handbook)	<b>USIT605</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Enterprise Networking

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Networking Fundamentals
2. Design and Configure Networks
3. Implement Network Services
4. Troubleshoot Network Issues
5. Implement Network Security

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	General Network Design:	Network Design Methodology, Architectures for the Enterprise, Borderless Networks Architecture, Collaboration and Video Architecture, Data Center and Virtualization Architecture, Design Lifecycle: Plan, Build, Manage Plan Phase Build Phase Manage Phase Prepare, Plan, Design, Implement, Operate, and Optimize Phases Prepare Phase Plan Phase Design Phase Implement Phase Operate Phase Optimize Phase Summary of PPDIOO Phases Project Deliverables Design Methodology Identifying Customer Design Requirements Characterizing the Existing Network Steps in Gathering Information Network Audit Tools Network Checklist Designing the Network Topology and Solutions Top-Down Approach Pilot and Prototype Tests Design Document	12
	Network Design Models:	Hierarchical Network Models Benefits of the Hierarchical Model, Hierarchical Network Design, Core Layer, Distribution Layer, Access Layer, Hierarchical Model Examples, Hub-and-Spoke, Design Collapsed Core, Design Enterprise Architecture Model, Enterprise Campus Module, Enterprise Edge Area, E-Commerce Module, Internet Connectivity Module, VPN/Remote Access, Enterprise WAN, Service Provider Edge Module, Remote Modules, Enterprise Branch Module, Enterprise Data Center Module, Enterprise Teleworker Module, High Availability Network Services, Workstation-to-Router	

		Redundancy and LAN, High Availability Protocols, ARP Explicit Configuration, RDP, RIP, HSRP, VRRP, GLBP, Server Redundancy, Route Redundancy, Load Balancing, Increasing Availability, Link Media Redundancy	
II	Enterprise LAN Design:	LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules, 1000BASE-LX Long-Wavelength Gigabit Ethernet, 1000BASE-SX Short-Wavelength Gigabit Ethernet, 1000BASE-CX Gigabit Ethernet over Coaxial Cable, 1000BASE-T Gigabit Ethernet over UTP 86, 10 Gigabit Ethernet Design Rules, 10GE Media Types, EtherChannel, Comparison of Campus Media LAN Hardware, Repeaters, Hubs, Bridges, Switches, Routers, Layer 3 Switches, Campus LAN Design and Best Practices Best Practices for Hierarchical Layers, Access Layer Best Practices, Distribution Layer Best Practices, Core Layer Best Practices, STP Design Considerations, STP Toolkit, PortFast, UplinkFast, BackboneFast, Loop Guard, Root Guard, BPDU Guard, BPDU Filter, VLAN and Trunk Considerations, Unidirectional Link Detection (UDLD) Protocol, Large-Building LANs, Enterprise Campus LANs, Edge Distribution, Medium-Size LANs, Small and Remote Site LANs, Server Farm Module, Server Connectivity Options, Enterprise Data Center Infrastructure, Campus LAN QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping.	12
	Data Center Design:	Enterprise DC Architecture, Data Center Foundation Components, Data Center Topology Components, Data Center Network Programmability, SDN, Controllers, APIs, ACI, Challenges in the DC, Data Center Facility Aspects, Data Center Space, Data Center Power, Data Center Cooling, Data Center Heat, Data Center Cabling, Enterprise DC Infrastructure, Data Center Storage, Data Center Reference Architecture, Defining the DC Access Layer, Defining the DC Aggregation Layer, Defining the DC Core Layer, Security in the DC, Fabric Extenders, Virtualization Overview, Challenges, Defining Virtualization and Benefits, Virtualization Risks, Types of Virtualization, Virtualization Technologies, VSS, VRF, vPC, Device Contexts, Server Virtualization, Server Scaling, Virtual Switching, Network Virtualization Design Considerations, Access Control, Path Isolation, Services Edge, Data Center Interconnect, DCI Use Cases, DCI Transport Options, DCI L2 Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.	

III	Wireless LAN Design:	Wireless LAN Technologies, WLAN Standards, ISM and UNII Frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X-2001 Port-Based Authentication, Dynamic WEP Keys and LEAP, Controlling WLAN Access to Servers, WLAN Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intracontroller Roaming, Layer 2 Intercontroller Roaming, Layer 3 Intercontroller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh Design Recommendations, Campus Design Considerations, Power over Ethernet (PoE), Wireless and Quality of Service (QoS), Branch Design Considerations, Local MAC, REAP, Hybrid REAP, Branch Office Controller Options.	12
	WAN Technologies and the Enterprise Edge:	WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Frame Relay, Time-Division Multiplexing, Metro Ethernet, SONET/SDH, Multiprotocol Label Switching (MPLS), Dark Fiber, Dense Wavelength-Division Multiplexing, Ordering WAN Technology and Contracts, WAN and Edge Design Methodologies, Response Time, Throughput, Reliability, Bandwidth Considerations, WAN Link Categories, Optimizing Bandwidth Using QoS, Queuing, Traffic Shaping and Policing, Classification, Congestion Management, Priority Queuing, Custom Queuing, Weighted Fair Queuing, Class-Based Weighted Fair Queuing, Low-Latency Queuing, Traffic Shaping and Policing, Link Efficiency, Window Size, DMZ Connectivity, Segmenting DMZs, DMZ Services, Internet Connectivity, Centralized Internet (Branch) vs. Direct Internet (Branch), High Availability for the Internet Edge, VPN Network Design.	
	WAN Design	Traditional WAN Technologies Hub-and-Spoke Topology Full-Mesh Topology Partial-Mesh Topology Point-to-Point Topology Remote Site Connectivity Enterprise VPN vs. Service Provider VPN Enterprise Managed VPN: IPsec IPsec Direct Encapsulation	

		<p>Generic Routing Encapsulation IPsec DMVPN IPsec Virtual Tunnel Interface Design GETVPN Service Provider–Managed Offerings ,Metro Ethernet Service Provider VPNs:L2 vs. L3 ,Virtual Private Wire Services VPWS L2 VPN Considerations ,Virtual Private LAN Services VPLS L2 VPN Considerations ,MPLS, MPLS Layer 3 Design Overview MPLS L3 VPN Considerations ,VPN Benefits WAN Backup Design WAN Backup over the Internet Enterprise WAN Architecture Cisco Enterprise MAN/WAN Enterprise WAN/MAN Architecture Comparison ,Enterprise WAN Components Comparing Hardware and Software Enterprise Branch Architecture Branch Design Branch Connectivity Redundancy for Branches Single WAN Carrier vs. Dual WAN Carriers Single MPLS Carrier Site ,Dual MPLS Carriers Hybrid WAN: L3 VPN with IPsec VPN ,Internet for Branches Flat Layer 2 vs. Collapsed Core ,Enterprise Branch Profiles Small Branch Design Medium Branch Design Large Branch Design Enterprise Teleworker Design ,ISRs for Teleworkers</p>	
IV	IPv4,IPv6, ICMPv6	<p>Internet Protocol Version 4 Design,IPv4 Header ToS IPv4 Fragmentation IPv4 Addressing ,IPv4 Address Classes Class A Addresses Class B Addresses ,Class C Addresses Class D Addresses Class E Addresses ,IPv4 Address Types IPv4 Private Addresses NAT ,IPv4 Address Subnets Mask Nomenclature IP Address Subnet Design Example Determining the Network Portion of an IP Address Variable-Length Subnet Masks, Loopback Addresses IP Telephony Networks ,IPv4 Addressing Design Goal of IPv4 Address Design , Plan for Future Use of IPv4 Addresses , Performing Route Summarization , Plan for a Hierarchical IP Address Network , Private and Public IP Address and NAT Guidelines , Steps for Creating an IPv4 Address Plan Case Study: IP Address Subnet Allocation , Address Assignment and Name Resolution , Recommended Practices of IP Address Assignment , BOOTP DHCP DNS , Internet Protocol Version 6 Design, IPv6 Header IPv6 Address Representation IPv4-Compatible IPv6 Addresses IPv6 Prefix Representation IPv6 Address Scope Types and Address Allocations IPv6 Address Allocations IPv6 Unicast Address Global Unicast Addresses Link-Local Addresses , Unique Local IPv6 Address Global Aggregatable IPv6 Address , IPv4-Compatible IPv6 Address IPv6 Anycast Addresses , IPv6 Multicast Addresses IPv6 Mechanisms, IPv6 Neighbor Discovery Protocol IPv6 Name Resolution ,Path MTU Discovery IPv6 ddress-Assignment Strategies , Manual</p>	12

		<p>Configuration SLAAC of Link-Local Address , SLAAC of Globally Unique IPv6 Address DHCPv6 , DHCPv6 Lite IPv6 Security IPv6 Routing Protocols RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) for IPv6 , IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing IPv6 for the Enterprise IPv6 Address Allocation , Partly Linked IPv4 Address into IPv6, Whole IPv4 Address Linked into IPv6</p> <p>IPv6 Addresses Allocated Per Location and/or Type , IPv4-to-IPv6 Transition Mechanisms and Deployment Models , Dual-Stack Mechanism IPv6 over IPv4 Tunnels , Protocol Translation Mechanisms IPv6 Deployment Models , Dual-Stack Model Hybrid Model Service Block Model ,IPv6 Deployment Model Comparison IPv6 Comparison with IPv4 ,OSPF, BGP, Route Manipulation, and IP Multicast,OSPFv2 OSPFv2 Metric OSPFv2 Adjacencies and Hello Timers , OSPFv2 Areas OSPF Area Design Considerations OSPF Router Types OSPF DRs LSA Types Autonomous System External Path Types OSPF Stub Area Types Stub Areas Totally Stubby Areas , NSSAs Virtual Links OSPFv2 Router Authentication , OSPFv2 Summary OSPFv3 OSPFv3 Changes from OSPFv2, OSPFv3 Areas and Router Types OSPFv3 LSAs OSPFv3 Summary BGP BGP Neighbors eBGP iBGP Route Reflectors Confederations BGP Administrative Distance, BGP Attributes, Weight, and the BGP Decision Process BGP Path Attributes Next-Hop Attribute Local Preference Attribute Origin Attribute Autonomous System Path Attribute MED Attribute Community Attribute Atomic Aggregate and Aggregator Attributes Weight BGP Decision Process, BGP Summary, Route Manipulation PBR Route Summarization Route Redistribution Default Metric OSPF Redistribution Route Filtering Transit Traffic Routing Protocols on the Hierarchical Network Infrastructure IP Multicast Review, Multicast Addresses Layer 3 to Layer 2 Mapping IGMP, IGMPv1 IGMPv2 IGMPv3 CGMP IGMP Snooping, Sparse Versus Dense Multicast Multicast Source and Shared Trees PIM PIM-SM PIM DR Auto-RP PIMv2 Bootstrap Router, DVMRP IPv6 Multicast Addresses</p>	
V	Managing Security	<p>Network Security Overview Security Legislation Security Threats Reconnaissance and Port Scanning Vulnerability Scanners Unauthorized Access Security Risks Targets Loss of Availability Integrity Violations and Confidentiality Breaches , Security Policy and Process Security Policy Defined , Basic Approach of a Security Policy Purpose of Security Policies, Security Policy</p>	12

		<p>Components Risk Assessment , Risk Index Continuous Security Integrating Security Mechanisms into Network Design Trust and Identity Management ,Trust Domains of Trust Identity Passwords Tokens Certificates ,Network Access Control Secure Services Encryption Fundamentals Encryption Keys VPN Protocols , Transmission Confidentiality Data Integrity Threat Defense , Physical Security Infrastructure Protection Security Management Solutions Security Solution Network Security Platforms , Trust and Identity Technologies Firewall Fundamentals ,Types of Firewalls Next-Gen Firewalls NAT Placement , Firewall Guidelines Firewall ACLs , Identity and Access Control Deployments Detecting and Mitigating Threats IPS/IDS Fundamentals IPS/IDS Guidelines , Threat Detection and Mitigation Technologies, Threat-Detection and Threat-Mitigation Solutions, FirePOWER IPS Security Management Applications, Security Platform Solutions Security Management Network Integrating Security into Network Devices IOS Security, ISR G2 Security Hardware Options Securing the Enterprise, Implementing Security in the Campus Implementing Security in the Data Center Implementing Security in the Enterprise Edge Network Management Protocols, Simple Network Management Protocol SNMP Components, MIB SNMP Message Versions SNMPv1 SNMPv2 SNMPv3, Other Network Management Technologies RMON, RMON2 NetFlow Compared to RMON and SNMP, CDP LLDP Syslog</p>	
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#### Learning Resources recommended:

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

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks)	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
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Name of the Course	<b>Enterprise Networking Practical</b>
Course Code (refer to student handbook)	<b>USIT6P5</b>
Class	<b>T.Y.B.Sc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
	<b>Discipline Specific Elective Practical (Any One)*</b>
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Enterprise Networking Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Networking Fundamentals
2. Design and Configure Networks
3. Implement Network Services
4. Troubleshoot Network Issues
5. Implement Network Security

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1	Configuring OSPF – I a Single-Area OSPF Link Costs and Interface Priorities b Multi-Area OSPF with Stub Areas and Authentication	3
2	Practical 2	Configuring OSPF – II a OSPF Virtual Links and Area Summarization b OSPF over Frame Relay	3+3
3	Practical 3	Redistribution and Administrative Distances a Redistribution Between RIP and OSPF b Manipulating Administrative Distances	3+3
4	Practical 4	BGP a Configuring BGP with Default Routing b Using the AS_PATH Attribute c BGP Route Reflectors and Route Filters	3+3
5	Practical 5	IPv6 a Configuring OSPF for IPv6 b Configuring 6to4 Tunnels	3
6	Practical 6	VLANs and EtherChannel a Static VLANS, VLAN Trunking, and VTP Domains and Modes b Configuring EtherChannel	3
7	Practical 7	Spanning Tree Protocol a Spanning Tree Protocol (STP) Default Behavior b Modifying Default Spanning Tree Behavior	3
8	Practical 8	VLAN and Spanning Tree a Per-VLAN Spanning Tree Behavior b Multiple Spanning Tree	3

9	Practical 9	Internal VLAN Routing a Inter-VLAN Routing with an External Router b Inter-VLAN Routing with an Internal Route Processor	3
10	Practical 10	Configure NAT Services	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

### Learning Resources recommended:

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

### Evaluation Pattern

#### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

#### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05

Name of the Course	<b>IT Service Management</b>
Course Code (refer to student handbook)	<b>USIT606</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: IT Service Management

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand IT Service Management principles
2. Have knowledge of ITSM processes
3. Be proficient in ITSM tools and technologies
4. Understand Service strategy and design
5. Know ITSM governance and continuous improvement
6. Be familiar with ITSM implementation and project management
7. Do Incident and problem management

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	IT Service Management	Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle.	12
	Service Strategy Principles:	Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles. Service Strategy: Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution.	
	Service Strategy:	Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution.	
	Challenges, Critical Success factors and risks:	Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.	
II	Service Design:	Fundamentals	12

	Service Design Principles:	Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models	
	Service Design Processes:	Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management	
	Challenges, Critical Success factors and risks:	Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	
III	Service Transition:	Fundamentals	12
	Service Transition Principles:	Principles Supporting Service Transition, Policies for Service Transition	
	Service Transition Processes:	Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management.	
	Challenges, Critical Success factors and risks:	Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	
IV	Service Operation:	Fundamentals	12
	Service Operation Principles:	Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation	
	Service Operation Processes:	Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.	
	Challenges, Critical Success factors and risks:	Challenges, Critical Success factors, Risks	

V	Continual Service Improvement(CSI) Principles:	CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.	12
	CSI Process:	The seven-step improvement process.	
	CSI Methods nad Techniques:	Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes,	
	Organising for CSI:	Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training.	
	Technology considerations:	Tools to support CSI activities.	
	Implementing CSI:	Critical Considerations for implementing CSI, The start, Governance, CSI and organisational change, Communication Strategy and Plan	

#### Learning Resources recommended:

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

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
-



Name of the Course	<b>Cyber Laws</b>
Course Code (refer to student handbook)	<b>USIT607</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>VI</b>
No of Credits	<b>2</b>
Nature	<b>Theory</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Cyber Laws

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Understand Cyber Law concepts
2. Get awareness of legal issues in cyberspace
3. Understand digital rights and freedoms
4. Be familiar with cybercrime legislation
5. Have knowledge of Legal considerations for cybersecurity
6. Perform Ethical and policy implications of cyber law

### Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Power of Arrest Without Warrant Under the IT Act, 2000:	A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for “About to Commit” an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment!	12
	Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:	Concept of “Cyber Crime “ and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.	
II	Contracts in the Infotech World:	Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act,1872, Contract Formation on the Internet, Terms and Conditions of Contracts.	12

	Jurisdiction in the Cyber World:	Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act, 2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.	
III	Battling Cyber Squatters and Copyright Protection in the Cyber World:	Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	12
IV	E-Commerce Taxation: Real Problems in the Virtual World:	A Tug of War on the Concept of 'Permanent Establishment', Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act, 1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance.	12

	Digital Signature, Certifying Authorities and E-Governance:	Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	
V	The Indian Evidence Act of 1872 v. Information Technology Act, 2000:	Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934.	12
	Protection of Cyber Consumers in India:	Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	

### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH Education		2001
2.	Cybersecurity Law	Jeff Kosseff	Wiley		2017

## Evaluation Pattern

### A. Continuous Internal Evaluation (40 Marks):

Method	Marks
Unit Test (MCQ / Descriptive – Based on Theory and/or Problems Online/Offline – 1 unit test of 20 marks	20
Assignments	10
Attendance and active participation in classroom	10

### B. Semester End Evaluation (Paper Pattern) (60 Marks – 2 hours):

Question No	Unit	Marks
1	I	12
2	II	12
3	III	12
4	IV	12
5	V	12

### Guidelines for paper pattern for Semester End Evaluation:

1. All questions will be compulsory.
  2. Descriptive type of questions, programming-based questions, problem solving / numericals based questions, single line answers, etc., will contain internal options.
  3. Refer **appendix I** for Paper pattern.
-

Name of the Course	<b>Advanced Mobile Programming Practical</b>
Course Code (refer to student handbook)	<b>USIT6P6</b>
Class	<b>T.Y.BSc.IT</b>
Semester	<b>IV</b>
No of Credits	<b>2</b>
Nature	<b>Practical</b>
Type (applicable to NEP only)	
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	<b>employability/ entrepreneurship/ skill development</b>

## Nomenclature: Advanced Mobile Programming Practical

### Course Outcomes:

On the successful completion of this course, the learner will be able to

1. Build enterprise level mobile applications with Kotlin on Android.
2. Understand both the basic and advanced concepts of Kotlin.
3. Understand why use Kotlin over Java.
4. Install and configure Android Studio.
5. Explain and use key Android programming concepts.

### Curriculum:

Sr. No.	Title	Learning Points	No of Lectures
1	Practical 1: Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals:	Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple "Hello World" program.	3
2	Practical 2: Programming Resources	Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	3+3
3	Practical 3: Programming Activities and fragments	Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments.	3+3
4	Practical 4: Programs related to different Layouts	Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.	3+3
5	Practical 5: Programming UI elements	AppBar, Fragments, UI Components	3
6	Practical 6:	Programming menus, dialog, dialog fragments	3

7	Practical 7: Programs on Intents, Events, Listeners and Adapters	The Android Intent Class, Using Events and Event Listeners	3
8	Practical 8	Programs on Services, notification and broadcast receivers	3
9	Practical 9	Database Programming with SQLite	3
10	Practical 10	Programming threads, handles and asynchronized programs	3
11	Practical 11	Programming Media API and Telephone API	3
12	Practical 12	Programming Security and permissions	3
13	Practical 13	Programming Network Communications and Services (JSON)	3

This is sample Practical list. Course instructor may change the practical as per syllabus.

#### Learning Resources recommended:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Android Programming with Kotlin for Beginners	John Horton	packt publisher	-	2019
2.	Head First Android Development: A Brain-Friendly Guide.	David Griffiths	O'Reilly Media, Inc.	-	2015
3	Android App Development for Dummies.	Michael Burton	Wiley	-	2015



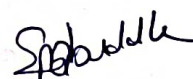
## Evaluation Pattern

### A. Continuous Internal Evaluation (20 Marks):

Method	Marks
Certified Journal	10
Attendance and active participation in Laboratory	10

### B. Semester End Evaluation (Paper Pattern) (30 Marks – 2 hours):

Question No	Unit	Marks
1	Program 1	10
2	Program 2	15
3	Viva	05



Chairperson

BoS, Information Technology

# APPENDIX I

## PAPER PATTERN

### 1. Internal Evaluation

Test: 1 Class test of 20 marks. (Can be taken online/offline)

<b>Q</b>	<b>Attempt <i>any four</i> of the following:</b>	<b>20</b>
<b>a.</b>		
<b>b.</b>		
<b>c.</b>		
<b>d.</b>		
<b>e.</b>		
<b>f.</b>		

### 2. External Examination: (60 marks) (Currently for SY and TY)

	<b>All questions are compulsory</b>	
<b>Q1</b>	<b>(Based on Unit 1) Attempt <i>any three</i> of the following:</b>	<b>12</b>
<b>a.</b>		
<b>b.</b>		
<b>c.</b>		
<b>d.</b>		
<b>e.</b>		
<b>f.</b>		
<b>Q2</b>	<b>(Based on Unit 2) Attempt <i>any three</i> of the following:</b>	<b>12</b>
<b>Q3</b>	<b>(Based on Unit 3) Attempt <i>any three</i> of the following:</b>	<b>12</b>
<b>Q4</b>	<b>(Based on Unit 4) Attempt <i>any three</i> of the following:</b>	<b>12</b>
<b>Q5</b>	<b>(Based on Unit 5) Attempt <i>any three</i> of the following:</b>	<b>12</b>

**3. External Examination: (60 marks) (For FY)**

	<b>All questions are compulsory</b>	
<b>Q1</b>	<b>(Based on Unit 1) Attempt <i>any three</i> of the following:</b>	<b>15</b>
<b>a.</b>		
<b>b.</b>		
<b>c.</b>		
<b>d.</b>		
<b>e.</b>		
<b>f.</b>		
<b>Q2</b>	<b>(Based on Unit 2) Attempt <i>any three</i> of the following:</b>	<b>15</b>
<b>Q3</b>	<b>(Based on Unit 3) Attempt <i>any three</i> of the following:</b>	<b>15</b>
<b>Q4</b>	<b>(Based on Units 1,2 &amp; 3) Attempt <i>any three</i> of the following:</b>	<b>15</b>
	<b>(Set 2 Sub questions on each unit)</b>	

# APPENDIX – II

## Programming Practical 1 Semester I And Programming Practical 2 Semester II

### Section II: Application Development using C/C++/Python/Java

The project documentation must be submitted in the following format.

#### Project Documentation

- **Basic requirement:**
  - Font size:12
  - Font Style: Arial
- **Documentation points:**
  1. Problem Statement
  2. Aim
  3. Overall Idea (About Project) & Objectives
  4. Description Of Components (used in project)
  5. Program
  6. Screenshot of Output

# APPENDIX – II

## Project Dissertation Semester V and Project Implementation Semester VI

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

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

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

phases of testing.

- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.
- Work effectively as an individual or as a team member to produce correct, efficient, well organized and documented programs in a reasonable time.
- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
- Develop of the ability to assess the implications of work performed.
- Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles
- Develop of the ability to communicate effectively.

## II. Type of the Project

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

### III. SOFTWARE AND BROAD AREAS OF APPLICATION

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

### IV.Introduction

The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include



the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendixes.

## **1.1 PROJECT REPORT:**

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

Table of Contents

Table of Figures

### **CHAPTER 1: INTRODUCTION**

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability

1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organization of Report

### **CHAPTER 2: SURVEY OF TECHNOLOGIES**

### **CHAPTER 3: REQUIREMENTS AND ANALYSIS**

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

### **CHAPTER 4: SYSTEM DESIGN**

4.1 Basic Modules

4.2 Data Design

- 4.2.1 Schema Design
- 4.2.2 Data Integrity and Constraints
- 4.3 Procedural Design
  - 4.3.1 Logic Diagrams
  - 4.3.2 Data Structures
  - 4.3.3 Algorithms Design
- 4.4 User interface design
- 4.5 Security Issues
- 4.6 Test Cases Design

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

## CHAPTER 5: IMPLEMENTATION AND TESTING

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

## CHAPTER 6: RESULTS AND DISCUSSION

- 6.1 Test Reports
- 6.2 User Documentation

## CHAPTER 7: CONCLUSIONS

- 7.1 Conclusion
  - 7.1.1 Significance of the System
- 7.2 Limitations of the System
- 7.3 Future Scope of the Project

REFERENCES

GLOSSARY

APPENDIX A

APPENDIX B

## **V. EXPLANATION OF CONTENTS**

### **Title Page**

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

### **Original Copy of the Approved Proforma of the Project Proposal**

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

### **Certificate of Authenticated work**

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

### **Role and Responsibility Form**

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

### **Abstract**

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

### **Acknowledgements**

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

### **Table of Contents:**

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

### **Table of Figures:**

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

### **Chapter 1: Introduction**

The introduction has several parts as given below:

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

**Objectives:** Concise statement of the aims and objectives of the project. Define exactly what is going to be done in the project; the objectives should be about 30 /40 words. **Purpose, Scope and Applicability:** The description of Purpose, Scope, and Applicability are given below:

- **Purpose:** Description of the topic of the project that answers questions on why this project is being done. How the project could improve the system its significance and theoretical framework.
- **Scope:** A brief overview of the methodology, assumptions and limitations. The students should answer the question: What are the main issues being covered in the project? What are the main functions of the project?
- **Applicability:** The student should explain the direct and indirect applications of their work. Briefly discuss how this project will serve the computer world and people. **Achievements:** Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? **Goals achieved -** describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.

Organization of Report: Summarizing the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

### **Chapter 2: Survey of Technologies**

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

### **Chapter 3: Requirements and Analysis**

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

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

**Planning and Scheduling:** Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules known as constraints, which, control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry out the plan. The student should show the Gantt chart and Program Evaluation Review Technique (PERT).

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

- **Hardware Requirement:** In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the

software must be noted. • **Software Requirements:** In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed. **Preliminary Product Description:** Identify the requirements and objectives of the new system. Define the functions and operation of the application/system the students are developing as project.

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

#### **Chapter 4: System Design**

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

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

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

- **Schema Design:** Define the structure and explanation of schemas used in the project.

- **Data Integrity and Constraints:** Define and explain all the validity checks and constraints provided to maintain data integrity.

**Procedural Design:** Procedural design is a systematic way for developing algorithms or procedurals.

- **Logic Diagrams:** Define the systematic flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.

- **Data Structures:** Create and define the data structure used in procedures. •

**Algorithms Design:** With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

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

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

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

## **Chapter 5: Implementation and Testing**

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

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

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

- Code Efficiency: The student should explain how the code is efficient and how the students have handled code optimization.

Testing Approach: Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain the approach of testing.

- Unit Testing: Unit testing deals with testing a unit or module as a whole. This

would test the interaction of many functions but, do confine the test within one module.

- **Integrated Testing:** Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.

**Modifications and Improvements:** Once the students finish the testing they are bound to be faced with bugs, errors and they will need to modify your source code to improve the system. Define what modification are implemented in the system and how it improved the system.

## **Chapter 6: Results and Discussion**

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

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

## **Chapter 7: Conclusions**

**Conclusion:** The conclusions can be summarized in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that would have made in the other chapters. **Limitations of the System:** Explain the limitations encountered during the testing of the project that the students were not able to modify. List the criticisms accepted during the demonstrations of the project.

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



## REFERENCES

It is very important that the students acknowledge the work of others that they have used or adapted in their own work, or that provides the essential background or context to the project. The use of references is the standard way to do this. Please follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports.

E.g:

Linhares, A., & Brum, P. (2007). Understanding our understanding of strategic scenarios: What role do chunks play? *Cognitive Science*, 31(6), 989-1007.  
<https://doi.org/doi:10.1080/03640210701703725>

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

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

## GLOSSARY

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

## APPENDICES

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

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

## **VI. SUMMARY**

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

## **VII. FURTHER READINGS**

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

**PROFORMA FOR THE APPROVAL PROJECT PROPOSAL**

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

PNR no.: ..... Roll no: \_\_\_\_\_

1. Name of the Student

\_\_\_\_\_

2. Title of the Project

\_\_\_\_\_

3. Name of the Guide

\_\_\_\_\_

4. Teaching experience of the Guide

\_\_\_\_\_

5. Is this your first submission? Yes No

Signature of the Student

Signature of the Guide

Date: .....

Date: .....

Signature of the Co-ordinator

Date: .....

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

# **TITLE OF THE PROJECT**

(NOT EXCEEDING 2 LINES, 24 BOLD, ALL CAPS)

**A Project Report (12 Bold)**

Submitted in partial fulfillment of the  
Requirements for the award of the Degree of (size-12)

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

**By(12 Bold)**

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

Seat Number (size-15)

**Under the esteemed guidance of (13 bold)**

**Mr./Mrs. Name of The Guide (15 bold, title case)**

**Designation (14 Bold, title case)**

**COLLEGE LOGO**

**DEPARTMENT OF INFORMATION TECHNOLOGY(12 BOLD, CAPS)**

**COLLEGE NAME (14 BOLD, CAPS)**

**CITY, PIN CODE(12 bold, CAPS)**

**MAHARASHTRA (12 bold, CAPS)**

**YEAR (12 bold)**

**COLLEGE NAME (14 BOLD, CAPS)**  
**CITY-MAHARASHTRA-PINCODE(13 bold, CAPS)**

**DEPARTMENT OF INFORMATION TECHNOLOGY (14 BOLD, CAPS)**

College Logo

**CERTIFICATE (14 BOLD, CAPS, underlined, centered)**

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

**Internal Guide (12 bold) Coordinator (Don't write names of lecturers or HOD)**

**External Examiner**

**Date: College Seal**

**COMPANY CERTIFICATE (if applicable)(on next page)**

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*S. Pawale*

chairperson,

BOS, Information Technology