



**Janardan Bhagat Shikshan Prasarak Sanstha's**  
**CHANGU KANA THAKUR**  
**ARTS, COMMERCE & SCIENCE COLLEGE,**  
**NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC**  
**'College with Potential for Excellence' Status Awarded by UGC**  
**'Best College Award' by University of Mumbai**

**Program: Bachelor's in Science (B. Sc.)**

**Revised Syllabus of T.Y.B.Sc. Information Technology**  
**Choice Based Credit System (60:40)**  
**w.e.f. Academic Year 2023-2024**

**T.Y.B.Sc Information Technology Syllabus**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
1	Title of Course	Information Technology
2	Eligibility for Admission	<p>(a) A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates.</p> <p>(b) Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course.</p> <p>(c) However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body. Minimum marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.</p> <p>OR</p> <p>Candidates with post HSC-Diploma in Information Technology/Computer Technology/ Computer Engineering/ Computer Science/ and Allied branches will be eligible for direct admission to the Second Year of B.Sc. (I.T.). However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body Minimum Marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.</p>
3	Passing marks	40%

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4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2023-2024

## **Preamble of the Syllabus:**

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

## **Objectives of the Course:**

The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Software Development (Programming)
- Website Development
- Mobile app development
- Embedded Systems Programming
- Embedded Systems Development
- Software Testing
- Networking
- Database Administration
- System Administration
- Cyber Law Consultant
- GIS (Geographic Information Systems)
- IT Service Desk
- Security

## **Programme Specific Outcome: By the end of the course, a student should develop the**

### **Ability:**

- Learners are able to use and apply current technical concepts and practices in the core information technologies.
- Learners are able to apply knowledge of computing and mathematics appropriate to the discipline.
- Learners are able to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- Learners are able to effectively integrate IT based solutions into the user environment.
- Learners are able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs.

### **Scheme of Examination**

**A) Internal Assessment: 40 %**

**40 Marks**

<b>Sr. No.</b>	<b>Particular</b>	<b>Marks</b>
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

### **Question Paper Pattern for Class Test**

<b>Question No.</b>	<b>Particular</b>	<b>Marks</b>
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) ( 1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

**B) Semester End Examination: 60 %**

**60 Marks**

- Duration: The examination shall be of 2 hours duration.

<b>Theory question paper pattern</b>
1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

### **➤ Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

**Choice Based Credit System (CBCS)**  
**T.Y.B. Sc. Information Technology Syllabus**  
**To be implemented from the Academic year 2023-2024**  
**SEMESTER V**

<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
<b>UIT5SPM</b>	Skill Enhancement Course	Software Project Management	2
<b>UIT5IOT</b>	Skill Enhancement Course	Internet of Things	2
<b>UIT5AWP</b>	Skill Enhancement Course	Advanced Web Programming	2
<b>UIT5LSA</b>	Discipline Specific Elective	Linux System Administration	2
<b>UIT5ENJ</b>	Discipline Specific Elective	Enterprise Java	2
<b>UIT5PDP</b>	Skill Enhancement Course Practical	Project Dissertation	2
<b>UIT5ITP</b>	Skill Enhancement Course Practical	Internet of Things Practical	2
<b>UIT5WPP</b>	Skill Enhancement Course Practical	Advanced Web Programming Practical	2
<b>UIT5LAP</b>	Discipline Specific Elective Practical	Linux Administration Practical	2
<b>UIT5EJP</b>	Discipline Specific Elective Practical	Enterprise Java Practical	2
<b>Total Credits</b>			<b>20</b>

**Choice Based Credit System (CBCS)**  
**T.Y.B. Sc. Information Technology Syllabus**  
**To be implemented from the Academic year 2023-2024**  
**SEMESTER VI**

<b>Course Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
<b>UIT6SQA</b>	Skill Enhancement Course	Software Quality Assurance	<b>2</b>
<b>UIT6SIC</b>	Skill Enhancement Course	Security in Computing	<b>2</b>
<b>UIT6BUI</b>	Skill Enhancement Course	Business Intelligence	<b>2</b>
<b>UIT6GIS</b>	Discipline Specific Elective	Principles of Geographic Information Systems	<b>2</b>
<b>UIT6ISM</b>	Discipline Specific Elective	IT Service Management	<b>2</b>
<b>UIT6PIP</b>	Skill Enhancement Course Practical	Project Implementation	<b>2</b>
<b>UIT6SCP</b>	Skill Enhancement Course Practical	Security in Computing Practical	<b>2</b>
<b>UIT6BIP</b>	Skill Enhancement Course Practical	Business Intelligence Practical	<b>2</b>
<b>UIT6GIP</b>	Discipline Specific Elective Practical	Principles of Geographic Information Systems Practical	<b>2</b>
<b>UIT6AMP</b>	Skill Enhancement Course Practical	Advanced Mobile Programming	<b>2</b>
<b>Total Credits</b>			<b>20</b>

## Semester V

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Software Project Management
<b>Course Code</b>	UIT5SPM
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to understand some problem and concern of software project manager, learners will able to cost estimation of project.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Define software project management and project planning
	2) Explain risk management and resource allocation
	3) Determine the cost of project based on project duration
	4) Elaborate the quality of leadership skills and advance project management tools.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction to Software Project Management:</b> 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.</p> <p><b>Project Evaluation and Programme Management:</b> Introduction, Business Case, Project Portfolio Management,</p>	12hrs



	<p>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.</p> <p><b>An Overview of Project Planning :</b> 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, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning</p>	
<p style="text-align: center;"><b>II</b></p>	<p><b>Selection of an Appropriate Project Approach:</b> 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.</p> <p><b>Software Effort Estimation:</b> 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, taffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.</p>	<p style="text-align: center;">12hrs</p>
<p style="text-align: center;"><b>III</b></p>	<p><b>Activity Planning:</b> 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.</p> <p><b>Risk Management:</b> Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm’s Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.</p> <p><b>Resource Allocation:</b> Introduction, Nature of Resources,</p>	<p style="text-align: center;">12hrs</p>

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	Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	
<b>IV</b>	<p><b>Monitoring and Control:</b> 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).</p> <p><b>Managing Contracts:</b> Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.</p> <p><b>Managing People in Software Environments:</b> Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.</p>	12hrs
<b>V</b>	<p><b>Working in Teams:</b> Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.</p> <p><b>Software Quality :</b>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.</p> <p><b>Monitoring and Control:</b> 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</p> <p><b>Emerging Trends in Software Project Management :</b> Expansion of Artificial Intelligence &amp; Automation, Inclusion of hybrid project management approaches, Impact of Emotional Intelligence, More focus on Data analytics and numbers, Advanced project management tools and solutions, Increased remote working.</p>	12hrs

**References:**

- 1) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
- 2) Project Management and Tools & Technologies – An overview, Shailesh Mehta 1st edition

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Project Dissertation
<b>Course Code</b>	UIT5PDP
<b>Credit</b>	2 Credit
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	The objective of this course is to understand some problem and concern of software project manager, learners will able to cost estimation of project.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Identify a problem definition.
	2) Estimate system requirement.
	3) Design data flow diagram.
	4) Plan the system design phase in SDLC.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<p><b>Project Implementation</b> Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.</p> <p><b>I. OBJECTIVES</b></p>	<b>2hrs</b>

	<ul style="list-style-type: none"><li>• Describe the Systems Development Life Cycle (SDLC).</li><li>• Evaluate systems requirements.</li><li>• Complete a problem definition.</li><li>• Evaluate a problem definition.</li><li>• Determine how to collect information to determine requirements.</li><li>• Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.</li><li>• Work on data collection methods for fact finding.</li><li>• Construct and evaluate data flow diagrams.</li><li>• Construct and evaluate data dictionaries.</li><li>• Evaluate methods of process description to include structured English, decision tables and decision trees.</li><li>• Evaluate alternative tools for the analysis process.</li><li>• Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.</li><li>• Decide the S/W requirement specifications and H/W requirement specifications.</li><li>• Plan the systems design phase of the SDLC.</li><li>• Distinguish between logical and physical design requirements.</li><li>• Design and evaluate system outputs.</li><li>• Design and evaluate systems inputs.</li><li>• Design and evaluate validity checks for input data.</li> <li>• Design and evaluate user interfaces for input.</li><li>• Design and evaluate file structures to include the use of indexes.</li><li>• Estimate storage requirements.</li><li>• Explain the various file update processes based on the standard</li></ul>	
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	<p>file organizations.</p> <ul style="list-style-type: none"><li>• Decide various data structures.</li><li>• Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.</li><li>• Perform normalization for the unnormalized tables for RDBMS related projects</li><li>• Decide the various processing systems to include distributed, client/server, online and others.</li><li>• Perform project cost estimates using various techniques.</li><li>• Schedule projects using both GANTT and PERT charts.</li><li>• Perform coding for the project.</li><li>• Documentation requirements and prepare and evaluate systems documentation.</li><li>• Perform various systems testing techniques/strategies to include the phases of testing.</li><li>• Systems implementation and its key problems.</li><li>• Generate various reports.</li><li>• Be able to prepare and evaluate a final report.</li><li>• Brief the maintenance procedures and the role of configuration management in operations.</li><li>• To decide the future scope and further enhancement of the system.</li><li>• Plan for several appendices to be placed in support with the project report documentation.</li><li>• Decide the various processing systems to include distributed, client/server, online and others.</li><li>• Perform project cost estimates using various techniques.</li><li>• Schedule projects using both GANTT and PERT charts.</li><li>• Perform coding for the project.</li><li>• Documentation requirements and prepare and evaluate systems documentation.</li></ul>	
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	<ul style="list-style-type: none"><li>• Perform various systems testing techniques/strategies to include the phases of testing.</li><li>• Systems implementation and its key problems.</li><li>• Generate various reports.</li><li>• Be able to prepare and evaluate a final report.</li><li>• Brief the maintenance procedures and the role of configuration management in operations.</li><li>• To decide the future scope and further enhancement of the system.</li><li>• Plan for several appendices to be placed in support with the project report documentation.</li> <li>• Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.</li><li>• Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.</li><li>• Develop of the ability to assess the implications of work performed.</li><li>• Get good exposure and command in one or more application areas and on the software</li><li>• Develop quality software using the software engineering principles</li><li>• Develop of the ability to communicate effectively.</li></ul> <p><b>II. Type of the Project</b></p> <p>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 <i>not mandatory</i> 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. <b>Approval of the project proposal is mandatory.</b> If</p>	
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approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

**III. SOFTWARE AND BROAD AREAS OF APPLICATION FRONT END**

<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
<b>NETWORK/WIRELESS TECHNOLOGIES</b>	-

**IV. Introduction**

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

**1.1 PROJECT REPORT:**

Title Page

Original Copy of the Approved Proforma of the Project Proposal	
Certificate of Authenticated work	
Role and Responsibility Form	
Abstract	
Acknowledgement	
Table of Contents	
Table of Figures	
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 Background	
1.2 Objectives	
1.3 Purpose, Scope, and Applicability	
1.3.1 Purpose	
1.3.2 Scope	
1.3.3 Applicability	
1.4 Achievements	
1.5 Organisation of Report	
<b>CHAPTER 2: SURVEY OF TECHNOLOGIES</b>	
<b>CHAPTER 3: REQUIREMENTS AND ANALYSIS</b>	
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	
<b>CHAPTER 4: SYSTEM DESIGN</b>	
4.1 Basic Modules	
4.2 Data Design	



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	<p>4.2.1 Schema Design</p> <p>4.2.2 Data Integrity and Constraints</p> <p>4.3 Procedural Design</p> <p>4.3.1 Logic Diagrams</p> <p>4.3.2 Data Structures</p> <p>4.3.3 Algorithms Design</p> <p>4.4 User interface design</p> <p>4.5 Security Issues</p> <p>4.6 Test Cases Design</p> <p>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</p>	
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**Reference Books:**

- 1) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
- 2) Project Management and Tools & Technologies – An overview, Shailesh Mehta 1st edition

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Internet of Things
<b>Course Code</b>	UIT5IOT
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To assess the vision and introduction of IoT. To Understand IoT Market perspective. To provide an understanding of the technologies and the standards relating to the Internet of Things.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain Design Principles for Connected Devices
	2) Elaborate the concepts of Prototyping Embedded Devices, its Physical Design and Online Components
	3) Classify types of designing 3D modules.
	4) Explain the Market perspective and Ethical concept of IOT.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
I	<p><b>The Internet of Things:</b> An Overview : The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects,</p> <p>Who is Making the Internet of Things?                      Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances.</p> <p><b>Internet Principles:</b>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</p>	12 hrs

	and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	
II	<p><b>Thinking About Prototyping:</b> 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.</p> <p><b>Prototyping Embedded Devices:</b> Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.</p> <p><b>Introduction to Raspberry Pi:</b> Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing raspberry Pi.</p> <p><b>Introduction to Arduino:</b> Introduction to Arduino, Arduino Hardware.</p>	12 hrs
III	<p><b>Prototyping the Physical Design:</b> Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.</p> <p><b>Prototyping Online Components:</b> 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</p>	12 hrs
IV	<p><b>Techniques for Writing Embedded Code:</b> Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging,</p> <p><b>Business Models:</b> 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,</p>	12 hrs

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	Crowdfunding, Lean Startups.	
V	<p><b>Moving to Manufacture:</b> 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.</p> <p><b>Ethics:</b> 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</p>	12 hrs

**References:**

- 1) Designing the Internet of Things , “Adrian McEwen” First Edition, WILEY
- 2) Internet of Things – Architecture and Design, “Raj Kamal”, First Edition, McGraw Hill

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Internet of Things Practical
<b>Course Code</b>	UIT5ITP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	To make the learners familiar with Raspberry Pi components and interface. To connect different hardware device with Raspberry Pi.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Make use of Raspberry pi to display LED pattern,Time over 4-digit 7-segment and control whatsapp.
	2) Build the interfacing of Raspberry pi with Oscilloscope, Fingerprint sensor,GPS Module.
	3) Create basic Home Automation using Raspberry Pi.
	4) Construct an application to monitor visitor using Raspberry Pi and Pi Camera.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>0</b>	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface,Connecting to Ethernet , Monitor and USB, Linux Commands: Exploring the Raspbian	2hrs
<b>1</b>	Linux Commands: Exploring the Raspbian	2hrs
<b>2</b>	Light the LED with Python	2hrs
<b>3</b>	Displaying different LED patterns with Raspberry Pi.	2hrs
<b>4</b>	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi	2hrs
<b>5</b>	Raspberry Pi Based Oscilloscope.	2hrs

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<b>6</b>	Controlling Raspberry Pi with WhatsApp.	2hrs
<b>7</b>	Setting up a Web Server using Raspberry Pi	2hrs
<b>8</b>	Setting up Wireless Access Point using Raspberry Pi	2hrs
<b>9</b>	Fingerprint Sensor interfacing with Raspberry Pi	2hrs
<b>10</b>	Raspberry Pi GPS Module Interfacing	2hrs
<b>11</b>	IoT based Web Controlled Home Automation using Raspberry Pi	2hrs
<b>12</b>	Visitor Monitoring with Raspberry Pi and Pi Camera	2hrs
<b>13</b>	Interfacing Raspberry Pi with RFID	2hrs
<b>14</b>	Building Google Assistant with Raspberry Pi.	2hrs
<b>15</b>	Installing Windows 10 IoT Core on Raspberry Pi	2hrs

**Reference Books:**

- 1) Designing the Internet of Things , “Adrian McEwen” First Edition, WILEY
- 2) Internet of Things – Architecture and Design, “Raj Kamal”, First Edition, McGraw Hill

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Advanced Web Programming
<b>Course Code</b>	UIT5AWP
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To learn to develop web applications that use object-oriented techniques and advanced database interactions. Concepts such as advanced CSS concepts web environment , authentication , and security will also be explored.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain the basic components concept of C# .NET framework language along with .NET framework
	2) Elaborate advanced web concept in ASP.NET
	3) Explain dynamic web page using ADO.NET fundamentals.
	4) Make use of AJAX ,XML and Jquary programming skill in ASP.NET.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<b>Introducing .NET:</b> The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	12 hrs

<p style="text-align: center;"><b>II</b></p>	<p><b>Web Form Fundamentals:</b> 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.</p> <p><b>Form Controls:</b> 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.</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>III</b></p>	<p><b>Error Handling, Logging, and Tracing :</b> Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing State Management : Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options Styles, Themes, and Master Pages : Styles, Themes, Master Page Basics, Advanced Master Pages</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>ADO.NET Fundamentals:</b> Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p> <p><b>Data Binding:</b> Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls</p> <p><b>The Data Controls:</b> 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</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;"><b>V</b></p>	<p><b>XML:</b> XML Explained, The XML Classes, XML Validation, XML Display and Transforms.</p> <p><b>Security Fundamentals:</b> Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p>	<p style="text-align: center;">12 hrs</p>



	<b>ASP.NET AJAX:</b> Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit. <b>JQuery:</b> Introduction to JQuery, JQuery syntax, JQuery Selector, JQuery events function, effects with JQuery	
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**References:**

- 1) Beginning ASP.NET 4.5 in C# ,mathevmacDonald,Apress
- 2) Murach's ASP.NET 4.6 Web Programming in C#2015, SPD,SixthEdition,Mary Delamater and Anne Bohem

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Advanced Web Programming Practical
<b>Course Code</b>	UIT5WPP
<b>Credit</b>	2 Credit
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	To learn to develop web applications that use object-oriented techniques and advanced database interactions. Concepts such as advanced CSS concepts web environment , authentication , and security will also be explored. web pages in asp.net and xml
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Build console application in C#.
	2) Develop web applications with strong object – oriented principles.
	3) Develop connection between web pages using ASP.NET AJAX.
	4) Build dynamic web page in ASP.NET , XML and JQuery.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<p><b>Working with basic C# and ASP .NET</b></p> <p>a. Create an application that obtains four int values from the user and displays the product.</p> <p>b. Create an application to demonstrate string operations.</p> <p>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 is entered. Create an application to demonstrate following operations</p> <p>i. Generate Fibonacci series. ii. Test for prime numbers.</p> <p>iii. Test for vowels. iv. Use of for each loop with arrays</p> <p>v. Reverse a number and find sum of digits of a number.</p>	<b>2hrs</b>

<p style="text-align: center;"><b>2</b></p>	<p><b>Working with Object Oriented C# and ASP .NET</b>  a. Create simple application to perform following operations  i. Finding factorial Value  ii. Money Conversion  iii. Quadratic Equation  iv. Temperature Conversion  b. Create simple application to demonstrate use of following concepts  i. Function Overloading  ii. Inheritance (all types)  iii. Constructor overloading  iv. Interfaces  c. Create simple application to demonstrate use of following concepts  i. Using Delegates and events  ii. Exception handling</p>	<p style="text-align: center;">2hrs</p>
<p style="text-align: center;"><b>3</b></p>	<p><b>Working with Web Forms and Controls</b>  a. Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example :AutoPostBack)  b. Demonstrate the use of Calendar control to perform following operations.  Display messages in a calendar control  i. Display vacation in a calendar control  ii. Selected day in a calendar control using style  iii. Difference between two calendar dates  c. Demonstrate the use of Treeviewcontrol perform following operations.  i. Treeview control and datalist  ii. Treeview operations</p>	<p style="text-align: center;">2hrs</p>
<p style="text-align: center;"><b>4</b></p>	<p><b>Working with Form Controls</b>  a. Create a Registration form to demonstrate use of various Validation controls.  b. Create Web Form to demonstrate use of Adrotator Control.  c. Create Web Form to demonstrate use User Controls.</p>	<p style="text-align: center;">2hrs</p>
<p style="text-align: center;"><b>5</b></p>	<p><b>Working with Navigation, Beautification and Master page.</b>  a. Create Web Form to demonstrate use of Website Navigation controls and Site Map.  b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.  c. Create a web application to demonstrate various states of ASP.NET Pages.</p>	<p style="text-align: center;">2hrs</p>
<p style="text-align: center;"><b>6</b></p>	<p><b>Working with Database</b>  a. Create a web application bind data in a multiline textbox by querying in another textbox.  b. Create a web application to display records by using database.  c. Demonstrate the use of Datalist link control.</p>	<p style="text-align: center;">2hrs</p>
<p style="text-align: center;"><b>7</b></p>	<p><b>Working with Database</b>  a. Create a web application to display Databinding using dropdownlist control.</p>	<p style="text-align: center;">2hrs</p>

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	b. Create a web application for to display the phone no of an author using database. c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).	
<b>8</b>	<b>Working with data controls</b> 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.	2hrs
<b>9</b>	Create a web application to display Using Disconnected Data Access and Databinding using GridView.	2hrs
<b>10</b>	<b>Working with GridView control</b> Create a web application to demonstrate use of GridView control template andGridView hyperlink.	2hrs
<b>11</b>	<b>Working with GridView control</b> Create a web application to demonstrate use of GridView button column and GridView events.	2hrs
<b>12</b>	<b>Working with GridView control</b> Create a web application to demonstrate GridView paging and Creating own table format using GridView.	2hrs
<b>13</b>	<b>Working with XML</b> Create a web application to demonstrate reading and writing operation with XML.	2hrs
<b>14</b>	<b>Working with JQuery</b> Create a web application to demonstrate different types of selector.	2hrs
<b>15</b>	<b>Working with AJAX</b> Create a web application to demonstrate use of various Ajax controls.	2hrs

**Reference Books:**

1. Beginning ASP.NET 4.5 in C# ,mathevmacDonald,Apress
2. Murach's ASP.NET 4.6 Web Programming in C#2015, SPD,SixthEdition,Mary Delamater and Anne Bohem

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Linux System Administration
<b>Course Code</b>	UIT5LSA
<b>Credit</b>	2 credit
<b>Hours</b>	4Hrs per week

<b>Course Objectives</b>	To make the learners familiar with linux operating system administration. Learners will be able to install and configure different types of servers such as mail server, Web server etc. They will also be able to create and handle user accounts and maintain its security.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Explain various commands to manage system level processes and handle software management on linux platforms.
	2) Elaborate storage and user management on linux platforms.
	3) Explain the detailed steps and files for configuration of different types of servers.
	4) Make use of shell level programming in linux.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction to Red Hat Enterprise Linux:</b> Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.</p> <p><b>Command Line:</b> 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</p> <p><b>System Administration Tasks:</b> Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, Using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate</p>	12 hrs

	<p><b>Booting and shutting down:</b> Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services.</p> <p><b>The File System:</b> Understanding the File System Structure, Working with Linux-Supported File Systems.</p>	
<b>II</b>	<p><b>Managing Software:</b> Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages</p> <p><b>Configuring and Managing Storage:</b> 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</p> <p><b>Connecting to the Network:</b> 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</p>	12 hrs
<b>III</b>	<p><b>Working with Users, Groups, and Permissions:</b> 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</p> <p><b>Securing Server with iptables:</b> 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,</p>	12 hrs

	<p>Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT</p> <p><b>Setting Up Cryptographic Services:</b> 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</p>	
<b>IV</b>	<p><b>Configuring Server for File Sharing:</b> 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.</p> <p><b>Configuring DNS and DHCP:</b> 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</p> <p><b>Setting Up a Mail Server:</b> 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</p>	12 hrs
<b>V</b>	<p><b>Configuring Apache on Red Hat Enterprise Linux:</b> 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</p> <p><b>Introducing Bash Shell Scripting:</b> 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.</p>	12 hrs

	<p><b>High-Availability Clustering:</b> 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</p> <p><b>Setting Up an Installation Server:</b> Configuring a Network Server as an Installation Server, Creating a Kickstart File, Using a Kickstart File to Perform an Automated Installation</p>	
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**Reference Books:**

- 1) Red Hat Enterprise Linux 6 Administration, Sander van Vugt, John Wiley and Sons
- 2) Red hat Linux Networking and System Administration,” Terry Collings and Kurt Wall” ,3<sup>rd</sup>Edition,Wiley



<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Linux System Administration Practical
<b>Course Code</b>	UIT5LAP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	To make the learners familiar with linux operating system administration. Learners will be able to install and configure different types of servers such as mail server, Web server etc. They will also be able to create and handle user accounts and maintain its security.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Make use of administrative level commands for user and storage management and Networking.
	2) Construct the firewall rules for securing server with iptables and setup cryptographic services on linux machine.
	3) Create the configuration for different types of servers.
	4) Develop shell scripting programs on linux platform.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Installation of RHEL 6.X	2hrs
<b>2</b>	Graphical User Interface and Command Line Interface and Processes a. Exploring the Graphical Desktop b. The Command Line Interface c. Managing Processes	2hrs
<b>3</b>	Storage Devices and Links, Backup and Repository a. Working with Storage Devices and Links b. Making a Backup c. Creating a Repository	2hrs
<b>4</b>	Working with RPM Storage and Networking a. Using Query Options b. Extracting Files From RPMs	2hrs
<b>5</b>	Working with RPM Storage and Networking a. Configuring and Managing Storage b. Connecting to the Network	2hrs

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<b>6</b>	Working with Users, Groups, and Permissions	2hrs
<b>7</b>	Securing Server with iptables	2hrs
<b>8</b>	Setting Up Cryptographic Services	2hrs
<b>9</b>	Configuring FTP	2hrs
<b>10</b>	Configuring DNS Server	2hrs
<b>11</b>	Configuring DHCP Server	2hrs
<b>12</b>	Web Server Configuring Apache on Red Hat Enterprise Linux	2hrs
<b>13</b>	a. Writing a Script to Monitor Activity on the Apache Web Server b. Using the select Command	2hrs
<b>14</b>	Shell Scripts and High-Availability Clustering a. Writing Shell Scripts b. Configuring Booting with GRUB c. Configuring High Availability Clustering	2hrs
<b>15</b>	Setting Up an Installation Server Configuring Network Server as an Installation Server.	2hrs

**Reference Books:**

- 1) Red Hat Enterprise Linux 6 Administration, Sander van Vugt, John Wiley and Sons
- 2) Red hat Linux Networking and System Administration,” Terry Collings and Kurt Wall” ,3<sup>rd</sup>Edition, Wiley

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Enterprise Java
<b>Course Code</b>	UIT5ENJ
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The objective of this course is to acquire the knowledge of advanced java technologies used in developing and deploying enterprise commercial website.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Define servlet with java applications and database connectivity.
	2) Elaborate the fundamentals and core concepts of cookies, session, file uploading, file downloading and request dispatcher, EJB applications and JND.
	3) Explain JSP applications using JSTL and deploy EJB application and JSF applications.
	4) Make use of knowledge of application using concept of Persistence, Object/Relational Mapping, JPA and Hibernate.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Understanding Java EE:</b> What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server</p> <p><b>Java EE Architecture, Server and Containers:</b> Types of System Architecture, Java EE Server, Java EE Containers.</p> <p><b>Introduction to Java Servlets:</b> The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do?</p> <p><b>Servlet API and Lifecycle:</b> Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet</p> <p><b>Working With Servlets:</b> Getting Started, Using</p>	12 hrs

	<p>Annotations Instead of Deployment Descriptor.  <b>Working with Databases:</b> What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.</p>	
<b>II</b>	<p><b>Request Dispatcher:</b> RequestDispatcher Interface, Methods of RequestDispatcher, RequestDispatcher Application.</p> <p><b>COOKIES:</b> Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing TheColors Of A Page</p> <p><b>SESSION:</b> What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example</p> <p><b>Working With Files:</b> Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application.</p> <p><b>Working With Non-Blocking I/O:</b> Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp</p>	12 hrs
<b>III</b>	<p><b>Introduction To Java Server Pages:</b> Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages</p> <p><b>Getting Started With Java Server Pages:</b> Comments, JSP Document, JSP Elements, JSP GUI Example.</p> <p><b>Action Elements:</b> Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabeen.</p> <p><b>Implicit Objects, Scope And El Expressions:</b> Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language.</p> <p><b>Java Server Pages Standard Tag Libraries:</b> What is wrong in using JSP ScriptletTags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages of JSTL, Tag Libraries.</p> <p><b>Java Server Faces:</b> What is JSF? Features of JSF, JSF Architecture, The JSF Lifecycle, Java Server Faces' User-Interface Components, Additional User-Interface</p>	12 hrs

	Component Libraries, JSF Development Tools	
IV	<p><b>Introduction To Enterprise Javabeans:</b> Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans</p> <p><b>Working With Session Beans:</b> 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.</p> <p><b>Working with Message Driven Beans:</b> Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.</p> <p><b>Interceptors:</b> Request And Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.</p> <p><b>Java Naming and Directory Interface:</b> 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.</p>	12 hrs
V	<p><b>Persistence, Object/Relational Mapping And JPA:</b> What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping,</p> <p><b>Introduction to Java Persistence API:</b> The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications.</p> <p><b>Writing JPA Application:</b> Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database And Tables in Mysql, Creating a Web Application, Adding the Required Library Files, Creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running The JPA Application.</p> <p><b>Introduction to Hibernate:</b> What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?</p>	12 hrs

	<p><b>Writing Hibernate Application:</b> 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.</p>	
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**References:**

- 1) “Java EE 7 For Beginners”, Sharanam Shah, Vaishali Shah, First Edition, SPD
- 2) “Advanced Java Programming”, Uttam Kumar Roy, Oxford Press

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	V
<b>Course Name</b>	Enterprise Java Practical
<b>Course Code</b>	UIT5EJP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	To provide a standard way to implement the server-side business software typically found in enterprise applications.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Create applications using servlet with cookies and session.
	2) Develop the servlet IO, file applications and JSP application.
	3) Construct JSP, JSTL, EL and EJB applications.
	4) Build the EJB applications with different types of beans and JPA applications.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Create a simple calculator application using servlet.	2hrs
<b>2</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".	2hrs
<b>3</b>	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.	2hrs
<b>4</b>	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.	2hrs

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<b>5</b>	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.	2hrs
<b>6</b>	Create a servlet that uses cookies to store the number of times the user has visited servlet.	2hrs
<b>7</b>	Create a Servlet application to upload and download a file.	2hrs
<b>8</b>	Develop a simple servlet question answer application using database.	2hrs
<b>9</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).	2hrs
<b>10</b>	Create a JSP application to demonstrate the use of JSTL.	2hrs
<b>11</b>	Create a Currency Converter application using EJB.	2hrs
<b>12</b>	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.	2hrs
<b>13</b>	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	2hrs
<b>14</b>	Create a Simple Java Server Faces Application to show message Hello.	2hrs
<b>15</b>	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.	2hrs

**Reference Books:**

- 1) "Java EE 7 For Beginners", Sharanam Shah, Vaishali Shah, First Edition, SPD
- 2) "Advanced Java Programming", Uttam Kumar Roy, Oxford Press



## Semester- VI

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Software Quality Assurance
<b>Course Code</b>	UIT6SQA
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The course is designed to introduce concepts about quality as the driving force behind success of software product, also focuses on life cycle of testing and different testing methodologies used for various test processes.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Define quality of software project
	2) Explain testing and different testing method
	3) Elaborate software verification, validation and v test model
	4) Classify level of testing

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction to Quality:</b> 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.</p> <p><b>Software Quality:</b> Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and</p>	12hrs

	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	
<b>II</b>	<b>Fundamentals of testing:</b> Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	12hrs
<b>III</b>	<b>Unit Testing: Boundary Value Testing:</b> Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, <b>Equivalence Class Testing:</b> Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. <b>Decision Table-Based Testing:</b> Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, <b>Path Testing:</b> Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, <b>Data Flow Testing:</b> Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	12hrs

<p><b>IV</b></p>	<p><b>Software Verification and Validation:</b> 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.</p> <p><b>V-test Model:</b> 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</p> <p><b>Automation Testing:</b> Introduction to Automation Testing, What is Automation testing, Benefits of Automation Testing.</p>	<p>12hrs</p>
<p><b>V</b></p>	<p><b>Levels of Testing:</b> 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.</p> <p><b>Special Tests:</b> 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, eBusinessCommerce Testing, Agile Development Testing, Data Warehousing Testing.</p>	<p>12hrs</p>

**Reference Books:**

- 1) Software Testing: Principles, Techniques and Tools M. G. Limaye TMH 2017
- 2) Software Testing and Continuous Quality Improvement William E. Lewis Third Edition 2016
- 3) Software Testing: A Craftsman's Approach Paul C. Jorgenson 4th Edition 2017

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Project Implementation
<b>Course Code</b>	UIT6PIP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	To define how exactly all tasks and the entire project will be executed. To create a plan that outlines the steps, timeline, resources and personal required for successful completion.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Design user interface for input
	2) Develop coding for the system
	3) Examine various system testing.
	4) Predict the future scope of project

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	<p><b>Project Implementation</b> Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.</p> <p><b>I. OBJECTIVES</b></p> <ul style="list-style-type: none"> <li>• Describe the Systems Development Life Cycle (SDLC).</li> <li>• Evaluate systems requirements.</li> <li>• Complete a problem definition.</li> </ul>	2hrs

	<ul style="list-style-type: none"><li>• Evaluate a problem definition.</li><li>• Determine how to collect information to determine requirements.</li><li>• Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.</li><li>• Work on data collection methods for fact finding.</li><li>• Construct and evaluate data flow diagrams.</li><li>• Construct and evaluate data dictionaries.</li><li>• Evaluate methods of process description to include structured English, decision tables and decision trees.</li><li>• Evaluate alternative tools for the analysis process.</li><li>• Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.</li><li>• Decide the S/W requirement specifications and H/W requirement specifications.</li><li>• Plan the systems design phase of the SDLC.</li><li>• Distinguish between logical and physical design requirements.</li><li>• Design and evaluate system outputs.</li><li>• Design and evaluate systems inputs.</li><li>• Design and evaluate validity checks for input data.</li> <li>• Design and evaluate user interfaces for input.</li><li>• Design and evaluate file structures to include the use of indexes.</li><li>• Estimate storage requirements.</li><li>• Explain the various file update processes based on the standard file organizations.</li><li>• Decide various data structures.</li><li>• Construct and evaluate entity-relationship (ER) diagrams for</li></ul>	
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	<p>RDBMS related projects.</p> <ul style="list-style-type: none"><li>• Perform normalization for the unnormalized tables for RDBMS related projects</li><li>• Decide the various processing systems to include distributed, client/server, online and others.</li><li>• Perform project cost estimates using various techniques.</li><li>• Schedule projects using both GANTT and PERT charts.</li><li>• Perform coding for the project.</li><li>• Documentation requirements and prepare and evaluate systems documentation.</li><li>• Perform various systems testing techniques/strategies to include the phases of testing.</li><li>• Systems implementation and its key problems.</li><li>• Generate various reports.</li><li>• Be able to prepare and evaluate a final report.</li><li>• Brief the maintenance procedures and the role of configuration management in operations.</li><li>• To decide the future scope and further enhancement of the system.</li><li>• Plan for several appendices to be placed in support with the project report documentation.</li><li>• Decide the various processing systems to include distributed, client/server, online and others.</li><li>• Perform project cost estimates using various techniques.</li><li>• Schedule projects using both GANTT and PERT charts.</li><li>• Perform coding for the project.</li><li>• Documentation requirements and prepare and evaluate systems documentation.</li><li>• Perform various systems testing techniques/strategies to include the phases of testing.</li><li>• Systems implementation and its key problems.</li></ul>	
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- 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 FRONT END**

<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
<b>NETWORK/WIRELESS TECHNOLOGIES</b>	-

**IV. Introduction**

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

**1.1 PROJECT REPORT:**

Title Page

Original Copy of the Approved Proforma of the Project Proposal



Certificate of Authenticated work	
Role and Responsibility Form	
Abstract	
Acknowledgement	
Table of Contents	
Table of Figures	
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 Background	
1.2 Objectives	
1.3 Purpose, Scope, and Applicability	
1.3.1 Purpose	
1.3.2 Scope	
1.3.3 Applicability	
1.4 Achievements	
1.5 Organisation of Report	
<b>CHAPTER 2: SURVEY OF TECHNOLOGIES</b>	
<b>CHAPTER 3: REQUIREMENTS AND ANALYSIS</b>	
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	
<b>CHAPTER 4: SYSTEM DESIGN</b>	
4.1 Basic Modules	
4.2 Data Design	
4.2.1 Schema Design	

	<p>4.2.2 Data Integrity and Constraints</p> <p>4.3 Procedural Design</p> <p>4.3.1 Logic Diagrams</p> <p>4.3.2 Data Structures</p> <p>4.3.3 Algorithms Design</p> <p>4.4 User interface design</p> <p>4.5 Security Issues</p> <p>4.6 Test Cases Design</p> <p>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.</p> <p><b>CHAPTER 5: IMPLEMENTATION AND TESTING</b></p> <p>5.1 Implementation Approaches</p> <p>5.2 Coding Details and Code Efficiency 68</p> <p>5.2.1 Code Efficiency</p> <p>5.3 Testing Approach</p> <p>5.3.1 Unit Testing</p> <p>5.3.2 Integrated Testing</p> <p>5.3.3 Beta Testing</p> <p>5.4 Modifications and Improvements</p> <p>5.5 Test Cases</p> <p><b>CHAPTER 6: RESULTS AND DISCUSSION</b></p> <p>6.1 Test Reports</p> <p>6.2 User Documentation</p> <p><b>CHAPTER 7: CONCLUSIONS</b></p> <p>7.1 Conclusion</p>	
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	<p>7.1.1 Significance of the System</p> <p>7.2 Limitations of the System</p> <p>7.3 Future Scope of the Project</p> <p>REFERENCES</p> <p>GLOSSARY</p> <p>APPENDIX A</p> <p>APPENDIX B</p> <p><b>V. EXPLANATION OF CONTENTS</b></p> <p><b>a)Title Page</b></p> <p>Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format.</p> <p><b>b)Original Copy of the Approved Proforma of the Project Proposal</b></p> <p>Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format. 69</p> <p><b>c)Certificate of Authenticated work</b></p> <p>Sample format of Certificate of Authenticated work is given in Appendix 3 of this block. Students should follow the given format.</p> <p><b>d)Role and Responsibility Form</b></p> <p>Sample format for Role and Responsibility Form is given in Appendix 4 of this block.</p> <p>Students should follow the given format.</p> <p><b>e)Abstract</b></p> <p>This should be one/two short paragraphs (100-150 words total), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.</p>	
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	<p><b>f)Acknowledgements</b></p> <p>This should express student’s gratitude to those who have helped in the preparation of project.</p> <p><b>h)Table of Contents</b></p> <p>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.</p> <p><b>i)Table of Figures</b></p> <p>List of all Figures, Tables, Graphs, Charts etc. along with their page numbers in a table of figures.</p> <p><b>Chapter 1: Introduction</b></p> <p>The introduction has several parts as given below:</p> <p><b>Background:</b> A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with the project work. 70</p> <p><b>Objectives:</b> 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.</p> <p><b>Purpose, Scope and Applicability:</b> The description of Purpose, Scope, and Applicability are given below:</p> <p><b>Purpose:</b> 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.</p> <p><b>Scope:</b> 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?</p> <p><b>Applicability:</b> The student should explain the direct and</p>	
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indirect applications of their work. Briefly discuss how this project will serve the computer world and people.

**Achievements:** Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? Goals achieved - describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.

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

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

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

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

**Problem Definition:** Define the problem on which the students are working in the project. 71

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

	<p>and problems of the existing system.</p> <p><b>Planning and Scheduling:</b> 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).</p> <p>Software and Hardware Requirements: Define the details of all the software and hardware needed for the development and implementation of the project.</p> <p><b>Hardware Requirement:</b> In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.</p> <p><b>Software Requirements:</b> 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.</p> <p>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.</p> <p>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.</p> <p><b>Chapter 4: System Design</b></p> <p>Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudocode and other documentation. 72</p> <p>Basic Modules: The students should follow the divide and conquer theory, so divide the overall problem into more</p>	
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	<p>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.</p> <p><b>Data Design:</b> Data design will consist of how data is organised, managed and manipulated.</p> <ul style="list-style-type: none"><li>• <b>Schema Design:</b> Define the structure and explanation of schemas used in the project.</li><li>• <b>Data Integrity and Constraints:</b> Define and explain all the validity checks and constraints provided to maintain data integrity.</li></ul> <p><b>Procedural Design:</b> Procedural design is a systematic way for developing algorithms or procedurals.</p> <ul style="list-style-type: none"><li>• <b>Logic Diagrams:</b> Define the systematical flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.</li><li>• <b>Data Structures:</b> Create and define the data structure used in procedures.</li><li>• <b>Algorithms Design:</b> With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.</li></ul> <p><b>User Interface Design:</b> 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.</p> <p><b>Security Issues:</b> 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?</p> <p><b>Test Cases Design:</b> Define test cases, which will provide easy detection of errors and mistakes with in a minimum period of time and with the least effort. Explain the different conditions in which the students wish to ensure the correct working of the project.</p>	
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## **Chapter 5: Implementation and Testing**

**Implementation Approaches:** Define the plan of implementation, and the standards the students have used in the implementation. 73

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

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

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

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

- **Unit Testing:** Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but, do confine the test within one module.

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

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

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

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



different conditions. Take the different sample inputs and show the outputs.

**User Documentation:** Define the working of the software; explain its different functions, components with screen shots. The user document should provide all the details of the product in such a way that any user reading the manual, is able to understand the working and functionality of the document. 74

**Chapter 7: Conclusions**

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

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

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

**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

\_\_\_\_\_

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	<hr/> <p>3. Name of the Guide</p> <hr/> <hr/>	
	<p>4. Teaching experience of the Guide</p> <hr/>	
	<p>5. Is this your first submission? Yes      No</p>	
	<p>Signature of the Student</p>	
	<p>Signature of the Guide</p>	
	<p>Date: .....</p>	<p>Date:</p>
	<p>.....</p>	
	<p>Signature of the Coordinator</p>	
	<p>Date: .....</p>	

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Security in Computing
<b>Course Code</b>	UIT6SIC
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To protect computer systems, networks, and data from unauthorized access, use, or disruption while ensuring confidentiality, integrity, and availability.
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<b>Course Outcomes</b>	<b>After completing the course, learners will be able to:</b>
	1) Evaluate and contrast computing security issues.
	2) Explain computing security vulnerabilities and threats.
	3) Determine alternative countermeasures and controls.
	4) Classify virtual machines and cloud computing.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Information Security Overview:</b> The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.</p> <p><b>Risk Analysis:</b> Threat Definition, Types of Attacks, Risk Analysis.</p> <p><b>Secure Design Principles:</b> The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p>	12hrs
<b>II</b>	<p><b>Authentication and Authorization:</b> Authentication, Authorization</p> <p><b>Encryption:</b> A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p>	12hrs

	<p><b>Storage Security:</b> Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.</p> <p><b>Database Security:</b> 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.</p>	
<b>III</b>	<p><b>Network Device Security:</b> Switch and Router Basics, Network Hardening.</p> <p><b>Firewalls:</b> Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p><b>Wireless Network Security:</b> 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.</p>	12hrs
<b>IV</b>	<p><b>Intrusion Detection and Prevention Systems:</b> IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).</p> <p><b>Voice over IP (VoIP) and PBX Security:</b> Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.</p> <p><b>Operating System Security Models:</b> Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.</p>	12hrs
<b>V</b>	<p><b>Virtual Machines and Cloud Computing:</b> Virtual Machines, Cloud Computing. Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments, Working of Cloud Computing, Principles of Parallel and Distributed Computing: Eras of Computing. Parallel v/s Distributed Computing. Elements of Parallel Computing. Elements of Distributed Computing, Technologies of distributed computing. Types of Cloud Computing &amp; usage.</p>	12hrs

**Reference Books:**

- 1) The Complete Reference: Information Security ,Mark Rhodes-Ousley, 2<sup>nd</sup>,McGraw-Hill
- 2) Essential Cybersecurity Science, Josiah Dykstra , Fifth, O'Reilly
- 3) Principles of Computer Security: CompTIA Security+ and Beyond ,Wm.ArthurConklin, Greg White, Second,McGraw Hill

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Security in Computing Practical
<b>Course Code</b>	UIT6SCP
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To implement effective measures and controls on computer systems, networks, and dat.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Design Routers by OSPF, NTP, SSH.
	2) Create AAA authentication.
	3) Apply & verify Extended Numbered ACL.
	4) Test IPV6 by using firewalls & ACL

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Implement Xen virtualization and Xen Centre.	2hrs
<b>2</b>	Configure AAA Authentication	2hrs
<b>3</b>	Configuring Extended ACLs Configure, Apply and Verify an Extended Numbered ACL	2hrs
<b>4</b>	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs	2hrs
<b>5</b>	Verify connectivity among devices before firewall configuration.	2hrs
<b>6</b>	Configure ACLs on to mitigate attacks.	2hrs
<b>7</b>	Configuring a Zone-Based Policy Firewall	2hrs
<b>8</b>	Configure IOS Intrusion Prevention System (IPS) Using the CLI	2hrs
<b>9</b>	Layer 2 Security Assign the Central switch as the root bridge.	2hrs

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	Secure spanning-tree parameters to prevent STP manipulation attacks.	
<b>10</b>	Layer 2 Security Enable port security to prevent CAM table overflow attacks.	2hrs
<b>11</b>	Layer 2 VLAN Security	2hrs
<b>12</b>	Configure and Verify a Site-to-Site IPsec VPN Using CLI	2hrs
<b>13</b>	Configuring ASA Basic Settings and Firewall Using CLI	2hrs
<b>14</b>	Configure basic ASA settings and interface security levels using CLI	2hrs
<b>15</b>	Configure routing, address translation, and inspection policy using CLI Configure DHCP, AAA, and SSH	2hrs

**Reference Books:**

- 1) The Complete Reference: Information Security ,Mark Rhodes-Ousley, 2<sup>nd</sup>,McGraw-Hill
- 2) Essential Cybersecurity Science, Josiah Dykstra , Fifth, O'Reilly
- 3) Principles of Computer Security: CompTIA Security+ and Beyond ,  
Wm.ArthurConklin, Greg White, Second,McGraw Hill

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Business Intelligence
<b>Course Code</b>	UIT6BUI
<b>Credit</b>	2
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.
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<b>Course Outcomes</b>	<b>After completing the course, Learners will be able to:</b>
	1) Explain the framework of the computerized Business Intelligence System and Decision support system.
	2) Analyse data by choosing relevant model as an algorithm for respective applications.
	3) Explain classification and clustering algorithms.
	4) Elaborate the applications of Business Intelligence.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<b>Business Intelligence:</b> Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence <b>Decision support systems:</b> Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	12

<b>II</b>	<p><b>Mathematical models for decision making:</b> Structure of mathematical models, Development of a model, Classes of models, Dimensional Modelling.</p> <p><b>Data mining:</b> Definition of data mining, Representation of input data , Data mining process, Analysis methodologies</p> <p><b>Data preparation:</b> Data validation, Data transformation, Data reduction</p>	12
<b>III</b>	<p><b>Classification:</b> Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines</p> <p><b>Clustering:</b> Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models</p>	12
<b>IV</b>	<p><b>Business intelligence applications:</b></p> <p><b>Marketing models:</b> Relational marketing, Sales force management,</p> <p><b>Logistic and production models:</b> Supply chain optimization, Optimization models for logistics planning, Revenue management systems.</p> <p><b>Data envelopment analysis:</b> Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices</p>	12
<b>V</b>	<p><b>Knowledge Management:</b> 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</p> <p><b>Artificial Intelligence and Expert Systems:</b> 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 , Fuzzy Logic</p>	12

**References:**

- 1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, First Edition , Wiley
- 2) Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, DursunDelen , Ninth, Pearson



<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Business Intelligence Practical
<b>Course Code</b>	UIT6BIP
<b>Credit</b>	2
<b>Hours</b>	2 Hrs per week

<b>Course Objectives</b>	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Import legacy data from sources and apply ETL process on it.
	2) Apply classification and clustering algorithms.
	3) Apply linear and logistic regression algorithms.
	4) Examine what if analysis for data visualization.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
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.)	2
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	2
3	Data visualization from ETL process.	2
4	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	2
5	Perform the data classification using classification algorithm.	2

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<b>6</b>	Perform the data clustering using clustering algorithm	2
<b>7</b>	Perform the Linear regression on the given data warehouse data.	2
<b>8</b>	Perform the logistic regression on the given data warehouse data.	2
<b>9</b>	Perform Decision tree using R tool	2
<b>10</b>	Data Analysis using time series Analysis	2
<b>11</b>	Data Modelling and Analytic with pivot table in Excel	2
<b>12</b>	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.	2
<b>13</b>	a. Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.	2
<b>14</b>	Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.	2
<b>15</b>	Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.	2

**Reference Books:**

- 1) Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Verzellis, First Edition , Wiley
- 2) Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, DursunDelen , Ninth, Pearson

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Principles of Geographical Information system
<b>Course Code</b>	UIT6GIS
<b>Credit</b>	2 Credit
<b>Hours</b>	4 Hrs per week

<b>Course Objectives</b>	The course is designed to introduce concepts about geographic information system to explore mapping data, analyze different mapping information and to create meaningful maps using different data.
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<b>Course Outcomes</b>	<b>After completing the course, Learners will be able to:</b>
	1) Define importance of GIS and its use in representation of the real world.
	2) Explain data capture, storage, analysis and output in GIS.
	3) Elaborate Map scale, projection and co-ordinate systems in GIS.
	4) Explain Spatial data analysis and Data visualization.

<b>Module/Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Gentle Introduction to GIS</b>  <b>The nature of GIS:</b> Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.  <b>The real world and representations of it:</b> Models and modelling, Maps, Databases, Spatial databases and spatial analysis  <b>Geographic Information and Spatial Database Models and Representations of the real world</b>  <b>Geographic Phenomena:</b> Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries  <b>Computer Representations of Geographic Information:</b> Regular tessellations, irregular tessellations, Vector representations, Topology and</p>	12hrs

	<p>Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects</p> <p><b>Organizing and Managing Spatial Data</b></p> <p><b>The Temporal Dimension</b></p>	
<b>II</b>	<p><b>Data Management and Processing Systems</b></p> <p><b>Hardware and Software Trends</b></p> <p><b>Geographic Information Systems:</b> GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)</p> <p><b>Stages of Spatial Data handling:</b> Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.</p> <p><b>Database management Systems:</b> Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database.</p> <p><b>GIS and Spatial Databases:</b> Linking GIS and DBMS, Spatial database functionality.</p>	12hrs
<b>III</b>	<p><b>Spatial Referencing and Positioning</b></p> <p><b>Spatial Referencing:</b> Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations.</p> <p><b>Satellite-based Positioning:</b> Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology</p> <p><b>Data Entry and Preparation</b></p> <p><b>Spatial Data Input:</b> Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere</p> <p><b>Data Quality:</b> Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency</p> <p><b>Data Preparation:</b> Data checks and repairs, Combining data from multiple sources</p> <p><b>Point Data Transformation:</b> Interpolating discrete data, Interpolating continuous data.</p>	12hrs
<b>IV</b>	<p><b>Spatial Data Analysis</b></p> <p><b>Classification of analytical GIS Capabilities</b></p> <p><b>Retrieval, classification and measurement:</b> Measurement, Spatial selection queries, Classification</p> <p><b>Overlay functions:</b> Vector overlay operators, Raster overlay operators</p> <p><b>Neighbourhood functions:</b> Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis</p> <p><b>Analysis:</b> Network analysis, interpolation, terrain</p>	12hrs

	<p>modeling                  Concepts and Principles of Web GIS, Significance of Web GIS; Transferred Geo data, Interactive Web Maps, Internet Map Services, Web GIS system Integration, Open Source GIS; Web Based Geo Portal, India Geoportal; State Geoportal and District Geoportal.</p>	
<b>V</b>	<p><b>Data Visualization</b>  <b>GIS and Maps, The Visualization Process</b>  <b>Visualization Strategies: Present or explore?</b>  <b>The cartographic toolbox:</b> What kind of data do I have? How can I map my data?  <b>How to map?</b> How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series  <b>Map Cosmetics, Map Dissemination.</b></p>	12hrs

**References:**

- 1) Principles of Geographic Information Systems, Otto Huisman and Rolf A. , The International Institute of Geoinformation Science and Earth Observation, Fourth edition, 2009.
- 2) Principles of Geographic Information Systems , P.A Burrough and R.A.McDonnell , Oxford University Press , Third edition, 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 edition , 2009 .
- 5) Introduction to Geographic Information Systems , Chang Kang-tsung (Karl), McGrawHill edition, Any above 3rd Edition.

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Principles of Geographical Information system Practical
<b>Course Code</b>	UIT6GIP
<b>Credit</b>	2
<b>Hours</b>	2Hrs per week

<b>Course Objectives</b>	Objective of this course is to Analyze various mapping techniques and make use of various mapping tools.
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<b>Course Outcomes</b>	<b>After completing the course, Learners will be able to:</b>
	1) Utilize QGIS software for managing vector and raster data.
	2) Build maps with attributes and different data sets.
	3) Design georeferencing for maps.
	4) Make use of advanced operations like Nearest Neighbourhood analysis, automating map creation etc.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	Creating and manging vector data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics.	2hrs
<b>2</b>	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.	2hrs
<b>3</b>	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files.	2hrs
	Using Plugins, Searching and Downloading OpenStreetMap Data.	2hrs
<b>4</b>	Working with attributes, terrain Data.	2hrs
<b>5</b>	Working with Projections and WMS Data.	2hrs
<b>6</b>	Georeferencing Topo Sheets.	2hrs

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<b>7</b>	Georeferencing Scanned Maps.	2hrs
<b>8</b>	Georeferencing Aerial Imagery.	2hrs
<b>9</b>	Digitizing Map Data.	2hrs
<b>10</b>	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis.	2hrs
<b>11</b>	Performing spatial queries.	2hrs
<b>12</b>	Introduction to Bhuvan ISRO software	2hrs
<b>13</b>	Bhuvan 2D.	2hrs
<b>14</b>	Bhuvan 3D.	2hrs
<b>15</b>	Special applications in Bhuvan.	2hrs

**Reference Books:**

- 1) Principles of Geographic Information Systems, Otto Huisman and Rolf A. , The International Institute of Geoinformation Science and Earth Observation, Fourth edition,2009.
- 2) Principles of Geographic Information Systems , P.A Burrough and R.A.McDonnell , Oxford University Press , Third edition,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 edition , 2009 .
- 5) Introduction to Geographic Information Systems , Chang Kang-tsung (Karl), McGrawHill edition, Any above 3rd Edition.

<b>Course Description: B.Sc. (Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	IT Service Management
<b>Course Code</b>	UIT6ISM
<b>Credit</b>	2 Credit
<b>Hours</b>	4 hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concept of the IT Service Management with respect to the services, to improve the end user experience and connecting IT to wider business objectives.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Define IT Service management and its framework.
	2) Demonstrate four dimensions of service management.
	3) Explain ITIL service value system, service value chain, and continual improvement model.
	4) Elaborate ITIL management practices.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs.</b>
<b>I</b>	<p><b>Introduction:</b></p> <p><b>IT Service Management:</b> Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle.</p> <p>IT service management in the modern world, The structure and benefits of the ITIL 4 framework, The ITIL SVS, The four dimensions model.</p>	<b>12hrs</b>
<b>II</b>	<p><b>Service Management:</b> Fundamentals</p> <p><b>Value and value co-creation:</b> Value co-creation.</p> <p><b>Organizations, service providers, service consumers, and other, Stakeholders:</b> Service providers, Service consumers, Other stakeholders. <b>Products and services:</b> Configuring resources for value creation, Service offerings.</p> <p><b>Service relationships:</b> The service relationship model.</p> <p><b>Value: outcomes, costs, and risks:</b> Outcomes, Costs, Risks, Utility and warranty.</p>	<b>12hrs</b>



<p style="text-align: center;"><b>III</b></p>	<p><b>The four dimensions of service management:</b> Organizations and people, Information and technology, Partners and suppliers, <b>Value streams and processes:</b> Value streams for service management, Processes. External factors.</p>	<p style="text-align: center;"><b>12hrs</b></p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>The ITIL service value system:</b> Service value system overview, Opportunity, demand, and value. <b>The ITIL guiding principles:</b> Focus on value, Start where you are, Progress iteratively with feedback, Collaborate and promote visibility, Think and work holistically, Keep it simple and practical, Optimize and automate, Principle interaction. <b>Governance:</b> Governing bodies and governance, Governance in the SVS <b>Service value chain:</b> Plan, Improve, Engage, Design and transition, Obtain/build, Deliver and support. <b>Continual improvement:</b> Steps of the continual improvement model, Continual improvement and the guiding principles.</p>	<p style="text-align: center;"><b>12hrs</b></p>
<p style="text-align: center;"><b>V</b></p>	<p><b>ITIL management practices:</b>  <b>General management practices:</b> Architecture management, Continual improvement, Information security management, Knowledge management, Measurement and reporting, Organizational change management, Portfolio management, Project management, Relationship management, Risk management, Service financial management, Strategy management, Supplier management, Workforce and talent management.  <b>Service management practices:</b> Availability management, Business analysis, Capacity and performance management, Change control, Incident management, IT asset management, Monitoring and event management, Problem management, Release management, Service catalogue management, Service configuration management, Service continuity management, Service design, Service desk, Service level management, Service request management, Service validation and testing.</p>	<p style="text-align: center;"><b>12hrs</b></p>

**Reference Books:**

- 1) ITIL v4 Foundation: ITIL 4 Edition, 2011

<b>Course Description: B.Sc.(Information Technology)</b>	
<b>Semester</b>	VI
<b>Course Name</b>	Advanced Mobile Programming
<b>Course Code</b>	UIT6AMP
<b>Credit</b>	2
<b>Hours</b>	2hrs per week

<b>Course Objectives</b>	The objective of this course is to introduce the concepts of Android Mobile Programming.
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<b>Course Outcomes</b>	<b>After completing the course, Student will be able to:</b>
	1) Demonstrate basic android app.
	2) Design activity life cycle.
	3) Evaluate different layouts in android app.
	4) Make use of intents, events, listeners and menus, dialog in mobile programming.

<b>Module/ Unit</b>	<b>Course Description</b>	<b>Hrs</b>
<b>1</b>	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.	<b>2 hrs</b>
<b>2</b>	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	<b>2 hrs</b>
<b>3</b>	Programming Activities and fragments: Activity Life Cycle	<b>2 hrs</b>
<b>4</b>	Programs related to different Layouts: Linear, Relative	<b>2 hrs</b>
<b>5</b>	Programs on Table Layout	<b>2 hrs</b>
<b>6</b>	Programming with Frame Layout	<b>2 hrs</b>
<b>7</b>	Programming with List View and Grid View	<b>2 hrs</b>
<b>8</b>	Programming using Events and Event Listener	<b>2 hrs</b>

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<b>9</b>	Programming with AppBar	<b>2 hrs</b>
<b>10</b>	Programming menus, dialog, dialog fragments	<b>2 hrs</b>
<b>11</b>	Programs on Services, notification and broadcast receivers	<b>2 hrs</b>
<b>12</b>	Programming Media API	<b>2 hrs</b>
<b>13</b>	Programming Telephone API	<b>2 hrs</b>
<b>14</b>	Programming Security and permissions	<b>2 hrs</b>
<b>15</b>	Programming Network Communications and Services (JSON)	<b>2 hrs</b>

**Reference Books:**

1. Android Programming with Kotlin for Beginners by John Horton
2. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition
3. Android Studio Development Essentials - Android 6 Edition