

## Master of Science (Information and Communication Technology)

Name of Program	Master of Science (Information and Communication Technology)
Abbreviation	M.Sc. (I.C.T.)
Duration	2 Years
Eligibility Criteria	Graduate in the discipline of computer application / computer science / computer engineering / Information Science / Information Technology
Objective of Program	To prepare human resources for cutting edge technologies in the field of ICT.
Program Outcome	<p><b>PO1 : Fundamental Knowledge Enrichment</b>                      Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes students capable of using core concepts in the conceptualization of domain specific application development.</p> <p><b>PO2 : Critical Thinking Development</b>                      The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem.</p> <p><b>PO3 : Advanced Emerging Technology Awareness</b>                      The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry.</p> <p><b>PO4 : Advanced Tools Usage</b>                      The program teaches the students to apply the advanced tools to solve real world problems.</p> <p><b>PO5 : Nurturing Project Planning and Management Capabilities</b>                      The program trains students for designing and conceptualizing the software architecture, planning and managing the product development process of complex and live software projects. It also makes students understand the decision making for selection of an appropriate project management capabilities.</p> <p><b>PO6 : Real World Problem / Project Development</b>                      Real world projects provide the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready.</p> <p><b>PO7 : Team Work and Leadership Development</b>                      Trains students to work in a team and also to take leadership of the of the project management team.</p>
Program Specific Outcomes	<p>PSO1 : Students will learn various aspects of Digital Communication Technologies.</p> <p>PSO2 : Students will be able to utilize knowledge of communication technologies in I.C.T. based applications.</p> <p>PSO3 : Students will be able to solve complex programming problems.</p>

P. V. Das

		<p>PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile applications, IOT applications, etc....</p> <p>PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.C.T domain.</p>																																																																						
Mapping between POs and PSOs		<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th colspan="2"></th> </tr> </thead> <tbody> <tr> <td>PO1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> </tbody> </table>								PSO1	PSO2	PSO3	PSO4	PSO5			PO1								PO2								PO3								PO4								PO5								PO6								PO7							
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PO5																																																																								
PO6																																																																								
PO7																																																																								
Medium of Instruction		English																																																																						
Program Structure		Semester 1																																																																						
Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks																																																																
		Theory	Practical		Duration	Marks																																																																		
ICT 101	Application Development using React.js	4	0	4	3 Hrs	70	30	100																																																																
ICT 102	Enterprise Java	4	0	4	3 Hrs	70	30	100																																																																
ICT 103	Information Security and Applications	4	0	4	3 Hrs	70	30	100																																																																
ICT 104	Advanced Computer Network	4	0	4	3 Hrs	70	30	100																																																																
ICT 105	Practical 1	-	3	3	2 Hrs	70	30	100																																																																
ICT 106	Practical 2	-	3	3	2 Hrs	70	30	100																																																																
ICT 107	Part Time Project 1	-	3	3	-	70	30	100																																																																
Total		16	9	25	-	490	210	700																																																																
Program Structure		Semester 2																																																																						
Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks																																																																
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ICT 201	Blockchain Computing	4	0	4	3 Hrs	70	30	100																																																																
ICT 202	Application Development using .NET Core	4	0	4	3 Hrs	70	30	100																																																																
ICT 203	Elective : Elective 1 Smart Device Computing using iOS Elective 2 Smart Device Computing using Android	4	0	4	3 Hrs	70	30	100																																																																
ICT 204	Digital Communication	4	0	4	3 Hrs	70	30	100																																																																
ICT 205	Practical 3	-	3	3	2 Hrs	70	30	100																																																																
ICT 206	Practical 4	-	3	3	2 Hrs	70	30	100																																																																
ICT 207	Part Time Project 2	-	3	3	-	70	30	100																																																																
Total		16	9	25	-	490	210	700																																																																

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## M. Sc. (I.C.T.) 1<sup>st</sup> Semester

### Course: 101: Frontend Development using React.js

Course Code	101																								
Course Title	Frontend Development using React.js																								
Credit	4																								
Teaching per Week	4 Hrs																								
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)																								
Effective From	June 2023																								
Purpose of Course	To provide knowledge of frontend development, HTML, CSS, JavaScript, Reactjs, XML, JSON and jQuery																								
Course Objective	To teach frontend development, HTML, CSS, JavaScript, Reactjs, XML, JSON and jQuery																								
Course Outcomes	<p>CO1 : Students will be able to learn about frontend development and HTML, CSS and JavaScript.</p> <p>CO2 : Students will be able to learn JavaScript frameworks like jQuery and ReactJS.</p> <p>CO3 : Students will be able to learn about AJAX, XML, JSON for frontend applications.</p>																								
Mapping between COs with PSOs	<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> </tbody> </table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
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CO1																									
CO2																									
CO3																									
Pre-requisite	Basic Programming Skills																								
Course Content	<p><b>Unit 1: Web and frontend Development Fundamentals and HTML</b></p> <p>1.1 Introduction: Web application, Client server architecture</p> <p>1.2 Frontend, Backend, Fullstack application development</p> <p>1.3 UI/UX, Search Engine Optimization</p> <p>1.4 Basics of XML, JSON</p> <p>1.5 HTML Structure, XHTML</p> <p>1.6 Links</p> <p>1.7 Images and ImageMaps</p> <p>1.8 Tables</p> <p>1.9 Forms</p> <p>1.10 Semantic and Non-semantic Elements</p> <p>1.11 HTML5 Elements and Input types</p> <p>1.12 Media: audio, embed, source, track, video</p> <p><b>Unit 2: CSS Fundamentals</b></p> <p>2.1 Style Sheet Types</p> <p style="padding-left: 20px;">2.1.1 Linked</p> <p style="padding-left: 20px;">2.1.2 Embedded</p> <p style="padding-left: 20px;">2.1.3 Inline</p> <p>2.2 Style Sheet Precedence</p> <p>2.3 Style Sheet Syntax</p> <p>2.4 Using Classes</p> <p>2.5 Font Control</p> <p>2.6 Text Control</p> <p>2.7 Color and Background</p> <p>2.8 List Box Control</p> <p>2.9 Miscellaneous Properties</p> <p style="padding-left: 20px;">2.9.1 Margin and Padding Properties</p> <p style="padding-left: 20px;">2.9.2 Border Properties</p> <p style="padding-left: 20px;">2.9.3 Tables</p> <p>2.10 Multi-Column Layouts</p>																								

*P. V. Desai*

- 2.11 gradients
- 2.12 Drop Shadows
- 2.13 2D Transforms
  - 2.13.1 Translate
  - 2.13.2 rotate
  - 2.13.3.scale
  - 2.13.4 skew
- 2.14 Introduction to Bootstrap framework
  - 2.14.1 Introduction to Responsive Design, Using Bootstrap in a Web page
  - 2.14.2 Typog aphy, Color management, Jumbotron, Images, Alerts, Buttons
- Unit 3: JavaScript and AJAX**
- 3.1 Basic of JavaScript Programming
- 3.2 The <script> tag – Basic Syntax
- 3.3 Client side scripting, Server side scripting
- 3.4 Variables
  - 3.4.1 Expressions
  - 3.4.2 Data Types
  - 3.4.3 Operators, Spread and rest operator
- 3.5 Strict Mode
- 3.6 var, let, const
- 3.7 Arrays, Strings, Template string
- 3.8 Objects and Classes
- 3.9 DOM
- 3.10 Client side storage
- 3.11 jQuery Basics
- 3.12 AJAX using various libraries
  - 3.12.1 Introduction to AJAX
  - 3.12.2 Call API
  - 3.12.3 Single page application development using AJAX
  - 3.12.4 AJAX calls using jQuery
- Unit 4: React.js**
- 4.1 React Introduction
  - 4.1.1 React application architecture
  - 4.1.2 Component
  - 4.1.3 JSX Overview
- 4.2 Virtual DOM and Single Page Application
- 4.3 Components
  - 4.3.1 Class Components
  - 4.3.2 Functional Components
  - 4.3.3 Nested Components
  - 4.4.4 Conditional and Looping constructs
  - 4.4 5 State
  - 4.4.6 Props
- 4.5 Event Handling
  - 4.5.1 Event Handling in Class Components
  - 4.5.2 Event Handling in Functional Components
- 4.6 Component Life Cycle Methods
- 4.7 React Hooks
- 4.8 Forms
- 4.9 Router
- 4.10 State Management
- 4.11 Redux
- 4.12 Calling Backend API

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	<b>Unit 5: Developer Tools</b> 5.1 Browser Tools 5.2 UI/UX Tools 5.3 Version Control using Git and others Tools 5.4 Application Deployment
Reference Book	<ol style="list-style-type: none"> <li>1. JavaScript Bible, 6th Edition – by Danny Goodman, Michael Morrison, Paul Novitski, Tia Gustaff Rayl</li> <li>2. JavaScript The Complete Reference 3rd Edition - by Thomas A. Powell , Fritz Schneider</li> <li>3. JavaScript Quick Syntax Reference By Mikael Olsson</li> <li>4. JavaScript: The Definitive Guide, 6th Edition By David Flanagan - O'Reilly Media</li> <li>5. Xml: The Complete Reference By Heather Williamson – Tata McGraw-Hill Edition</li> <li>6. Learning JavaScript, 3rd Edition By Ethan Brown - O'Reilly Media, Inc.</li> <li>7. Learning jQuery 4th edition, By Jonathan Chaffer, Karl Swedberg</li> <li>8. Web Development with jQuery, By Richard York – WROX Publication</li> <li>9. Thomas: HTML &amp; CSS: The Complete Reference, Fifth Edition : TMH:</li> <li>10. Bootstrap: Jake Spurlock - O'Reilly</li> <li>11. Search Engine Optimization: Harold Davis - O'Reilly</li> <li>12. React Explained: Your Step-by-Step Guide to React, OS Training, LLC</li> <li>13. Beginning React, Greg Lim</li> <li>14. Learning React: Functional Web Development with React and Redux, Shroff/O'Reilly</li> <li>15. Learn React Hooks: Build and refactor modern React.js applications using Hooks, Packt Publishing Limited</li> </ol>
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

*P. V. Desai*

## M.Sc. (I.C.T.) 1<sup>st</sup> Semester

### Course : ICT 102 : Enterprise Java

Course Code	ICT 102																								
Course Title	Enterprise Java																								
Credit	4																								
Teaching per Week	4 Hrs																								
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)																								
Last Review / Revision	June 2020																								
Purpose of Course	This course helps students to get an idea about how to use Java in Web and Enterprise Programming																								
Course Objective	The objective of the course is to make them understand and implement the Web Oriented Project Development Model of Java																								
Course Out come	CO1 : Students will be able to develop Large scale Enterprise Application in Java CO2: Students will learn major UI frameworks in Java CO3 ; Student will learn to create fully secure applications																								
Mapping between COs with PSOs	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> </tr> </thead> <tbody> <tr> <th>CO1</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <th>CO2</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <th>CO3</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> </tbody> </table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
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Pre-requisite	Understanding of OOPS concept and its implementation by Java Language																								
Course Content	<p><b>Unit 1 : Java EE and SERVLETS</b></p> <p>1.1 Java EE Architecture            1.2 Introduction to Java Servlets            1.3 The Java Servlet API            1.4 Servlet Life Cycle            1.4 Request and Response            1.5 Working with Databases            1.6 Dispatching and forwarding the request            1.7 Session Tracking            1.8 ServletConfig and ServletContext            1.9 Servlet Filters            1.10 Servlet Web Listeners            1.11 Java Server Pages</p> <p><b>Unit 2: - Enterprise Java Beans</b></p> <p>2.1 Introduction to EJB            2.2 Stateless Session Bean            2.3 Stateful Session Bean            2.4 Java Messaging Service Architecture            2.5 Message Driven Beans            2.6 Singleton Beans            2.7 Timers and Schedulers            2.8 Asynchronous Beans</p>																								

*P. V. D. S. S.*



	<p><b>Unit 3 -JAVA PERSISTANCE and REST API</b></p> <p>3.1 JPA architecture</p> <p>3.2 ORM with Entities</p> <p>3.3 Working with Relationships</p> <p>3.4 Named Queries</p> <p>3.5 Dynamic Queries AND Native Queries</p> <p>3.6 REST services with JAX-RS</p> <p>3.7 Using HTTP Methods in REST</p> <p>3.8 JERSEY Client for REST Services</p> <p><b>Unit -4 ENTERPRISE APPLICATION SECURITY</b></p> <p>4.1 Java EE Security Model</p> <p>4.2 Credentials and Identity Stores</p> <p>4.3 Authentication and Authorization Mechanisms</p> <p>4.4 Data Integrity and Confidentiality</p> <p>4.5 Securing Enterprise Applications</p> <p>4.6 JWT based Authorization</p> <p>4.7 OAuth and OpenIdConnect</p> <p><b>Unit 5 : THE JAVA WEB APPLICATION FRAMEWORKS</b></p> <p>5.1 Component Based Framework – JAVA SERVER FACES</p> <p>5.1.1 Introduction to JSF</p> <p>5.1.2 Request Processing Lifecycle</p> <p>5.1.3 JSF Managed Beans</p> <p>5.1.4 JSF UI Components</p> <p>5.1.5 JSF Validators and Converters</p> <p>5.1.6 Event Handling</p> <p>5.1.7 Composite Components</p> <p>5.1.8 Templating in JSF</p> <p>5.1.9 Working with primefaces</p> <p>5.2 Action Based Framework – SPRING</p> <p>5.2.1 Introduction to Spring</p> <p>5.2.2 Lifecycle of Spring MVC</p> <p>5.2.3 DispatcherServlet</p> <p>5.2.4 Multiple Controllers</p> <p>5.2.5 Working with databases</p> <p>5.2.6 Spring Boot</p>
Reference Book	<ol style="list-style-type: none"> <li>1. JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book, 2ed - Santosh Kumar, Dreamtech Press</li> <li>2. Servlet &amp; JSP: A Beginner's Tutorial - Budi Kurniawan, Brainy Software</li> <li>3. The Definitive Guide to JSF in Java EE 8: Building Web Applications with JavaServer Faces - Bauke Scholtz, Arjan Tijms – Apress</li> <li>4. Mastering Enterprise JavaBeans and the Java 2 Platform, Enterprise Edition, by Ed Roman</li> <li>5. Beginning Java™ EE 7 Platform with Payara™ 5: From Novice to Professional by Antonio Goncalves</li> </ol>

*P. M. D. S.*

	<ol style="list-style-type: none"><li>6. Mastering JavaServer Faces 2.2 - Anghel Leonard - Packt Publishing</li><li>7. Spring in Action 4ed - Craig Walls – Manning</li><li>8. Getting Started With Spring Framework: A Hands-on Guide to Begin Developing Applications Using Spring Framework - Ashish Sarin, J Sharma - Createspace Independent Pub</li><li>9. Spring 5 Design Patterns - Dinesh Rajput – Packt</li><li>10. Learning Spring Boot 2.0 - Greg L. Turnquist - Packt</li></ol>
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

*P. V. D. S. M.*



**M.Sc(ICT) 1<sup>st</sup> Semester**  
**Course : 103 : Information Security and Applications**

Course Code	103																								
Course Title	Information Security and Applications																								
Credit	4																								
Teaching per Week	4 Hrs																								
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)																								
Last Review / Revision	June 2023																								
Purpose of Course	This course is designed to provide students with the necessary background and knowledge to identify security risks and develop appropriate counter measures.																								
Course Objective	To provide an understanding of principal components, major issues, technologies, and basic approaches in information security																								
Course outcome	CO1 : Students will be able to learn and implement various cryptographic algorithms using private and public cryptography. CO2 : Students will be able to learn basic of block chain technology including hash algorithms. CO3 : Students will be able to learn working of various security protocols like IPsec,SSL, SSH,etc...																								
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CO1																									
CO2																									
CO3																									
Pre-requisite	Basic concepts of computer network																								
Course Content	<p><b>Unit 1 : Introduction to Information Security</b></p> <p>1.1 Introduction to Security  1.2 Need for Security  1.3 The OSI Security Architecture  1.4 Security Attacks  1.4.1 Active attacks  1.4.2 Passive Attacks  1.5 Security Services  1.6 Security Mechanism</p> <p><b>Unit 2 : Cryptography</b></p> <p>2.1 Classical Encryption Techniques  2.1.1 The substitution and Transposition Techniques  2.1.2 The Hill Cipher, Vignere Cipher  2.1.3 Rotor Machines  2.1.4 Steganography  2.1.5 Theoretical Security and Computational Security  2.1.6 Motivation for Product Cryptosystems</p> <p>2.2 Symmetric key cryptography  2.2.1 Block Cipher Principles  2.2.2 Data Encryption Standard (DES)  2.2.3 Advanced Encryption Standard (AES)  2.2.4 Attacks on DES and AES  2.2.5 Block Cipher modes of Operation  2.2.6 Introduction to Stream Cipher  2.2.6.1 RC4 Algorithm</p> <p>2.3 Asymmetric Key cryptography  2.3.1 Principles of Public Key Cryptosystem  2.3.2 The RSA Algorithm  2.3.3 Attacks on RSA</p>																								

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	<p>2.3.4 Key Management</p> <p>2.3.4.1 Key Distribution Scenarios</p> <p>2.3.4.2 Key Management</p> <p>2.3.4.3 Diffie Hellman Key Exchange</p> <p><b>Unit 3 : Integrity , Authentication and Hash Functions</b></p> <p>3.1 Introduction</p> <p>3.2 Authentication Requirements &amp; its functions</p> <p>3.3 Message Authentication</p> <p>3.3.1 Message Authentication Codes</p> <p>3.3.2 Hash Functions</p> <p>3.3.3 MD5, SHA algorithms</p> <p>3.3.4 Applications of SHA (e.g BlockChain)</p> <p>3.4 User Authentication</p> <p>3.4.1 Remote User Authentication Principles</p> <p>3.4.2 Remote User Authentication using Symmetric Encryption</p> <p>3.4.3 Kerberos</p> <p>3.5 Digital Signatures and Authentication Protocols</p> <p>3.5.1 Introduction to digital signatures</p> <p>3.5.2 Authentication Protocols</p> <p>3.5.3 Digital Signature Standard</p> <p><b>Unit 4 : Network /IP Security</b></p> <p>4.1 IP Security Overview</p> <p>4.2 Security in IPV4 and IPV6, Trade off involved</p> <p>4.3 Encapsulating Security Payload</p> <p>4.4 Security Associations</p> <p>4.5 Internet Key Exchange</p> <p>4.6 Cryptographic Suites</p> <p>4.7 Firewalls</p> <p>4.8 Biometrics</p> <p><b>Unit 5 : Transport and Application Layer Security</b></p> <p>5.1 Web Security Issues</p> <p>5.2 Secure Socket Layer(SSL)</p> <p>5.3 Transport Layer Security</p> <p>5.4 HTTPS</p> <p>5.5 Secure Shell</p> <p>5.6 Email Security: PGP,SMIME</p>
Reference Book	<ol style="list-style-type: none"> <li>1. Cryptography and Network Security – Principles and Practice – William Stallings- Seventh Edition- Pearson Publication</li> <li>2. Cryptography and Network Security- Behrouz A. Forouzan – McGrawHill Publication</li> <li>3. Modern Cryptography, Theory &amp; Practice -Wenbo Mao-Pearson Education</li> <li>4. Information Security: Theory and Practice – Dhiren R. Patel – PHI</li> <li>5. Cryptography and Network Security – Atul Kahate - 4<sup>th</sup> Edition - McGrawHill Publication</li> </ol>
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

*Pr. V. Desai*

**M.Sc(ICT) 1<sup>st</sup> Semester**  
**Course :104: Advanced Computer Network**

Course Code	104																								
Course Title	Advanced Computer Network																								
Credit	4																								
Teaching per Week	4 Hrs																								
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)																								
Last Review / Revision	June 2023																								
Purpose of Course	To provide the student with knowledge of advanced network concepts and techniques																								
Course Objective	The course objective is to introduce inter-networking, routing and network management concepts.																								
Course outcome	CO1 : Students will be able to understand the fundamental concepts of data communication and computer networking. CO2 : Students will be able to analyze the topological and routing strategies for an IP based networking infrastructure and understand how errors detected and corrected that occur in transmission. CO3 : Students will be able to understand transport layer functions and know about different application layer protocols.																								
Mapping between COs with PSOs	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO3</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
	PSO1	PSO2	PSO3	PSO4	PSO5																				
CO1																									
CO2																									
CO3																									
Prerequisite	Basic concepts of computer network																								
Course Content	<p><b>Unit 1 : Introduction</b></p> <p>1.1 Internet Protocols and Standards</p> <p>1.1.1 History</p> <p>1.1.2 Protocols &amp; Standards</p> <p>1.1.3 Standards &amp; Organizations</p> <p>1.1.4 Internet Standards</p> <p>1.1.5 Internet Administration</p> <p>1.2 Overview of OSI Model and TCP/IP Model</p> <p><b>Unit 2 : Overview of physical and data link layer</b></p> <p>2.1 Overview of Network Topologies</p> <p>2.2 Overview of Data Link Layer Protocols</p> <p>2.3 Functions of Data Link Layer</p> <p><b>Unit 3 : Network Layer &amp; Protocols</b></p> <p>3.1 IP addressing</p> <p>3.1.1 IP Classfull addressing</p> <p>3.1.1.1 Subnetting, Supernetting</p> <p>3.1.2 IP Classless addressing</p> <p>3.1.2.1 Variable length blocks</p> <p>3.1.2.2 Subnetting</p> <p>3.2 Special Addresses</p> <p>3.3 Delivery, Formatting and Routing</p> <p>3.4 ARP and RARP</p> <p>3.5 Internet Protocol (IP)</p> <p>3.5.1 Datagram</p> <p>3.5.2 Fragmentation</p> <p>3.5.3 Options</p> <p>3.5.4 Checksum</p> <p>3.5.5 IP Package</p>																								

*P. V. Das*

	<p>3.6 ICMP</p> <p>3.7 IGMP</p> <p>3.8 Mobile IP</p> <p>3.8.1 Addressing</p> <p>3.8.2 Agents</p> <p>3.8.3 Three Phases</p> <p>3.8.4 Inefficiency in Mobile IP</p> <p>3.9 Introduction to IPv6</p> <p>3.9.1 Representation</p> <p>3.9.2 Address Space, Address space allocation</p> <p>3.9.3 Auto Configuration, Renumbering</p> <p>3.9.4 Transition from IPV4 to IPV6</p> <p>3.9.5 IPV6 Protocol</p> <p>3.9.5.1 Packet Format, Extension Header</p> <p><b>Unit 4 : Transport Layer</b></p> <p>4.1 Transport Layer Services</p> <p>4.2 Transport Layer Protocols</p> <p>4.2.1 UDP</p> <p>4.2.1.1 User Datagram</p> <p>4.2.1.2 Checksum</p> <p>4.2.1.3 UDP Operations</p> <p>4.2.1.4 Use of UDP</p> <p>4.2.2 TCP</p> <p>4.2.2.1 TCP Services</p> <p>4.2.2.2 TCP Features</p> <p>4.2.2.3 TCP Segment</p> <p>4.2.2.4 Format</p> <p>4.2.2.5 Encapsulation</p> <p>4.2.2.6 TCP Connection</p> <p>4.2.2.7 State Transition Diagram</p> <p>4.2.2.8 Flow Control</p> <p>4.2.2.9 Error Control</p> <p>4.2.2.10 Congestion Control</p> <p>4.2.2.11 TCP Timers</p> <p>4.2.2.12 TCP Options</p> <p><b>Unit 5 : Application Layer</b></p> <p>5.1 Introduction</p> <p>5.2 Client Server Paradigm</p> <p>5.3 DNS</p> <p>5.4 SNMP</p> <p>5.5 Electronic Mail (SMTP, POP3, MIME, IMAP)</p> <p>5.6 WWW &amp; HTTP</p> <p>5.7 File Transfer: FTP &amp; TFTP</p> <p>5.8 Remote Login: TELNET</p> <p>5.9 Host Configuration : BOOTP &amp; DHCP</p>
Reference Book	<ol style="list-style-type: none"> <li>1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 4<sup>th</sup> Edition</li> <li>2. TCP/IP Guide – A Comprehensive, Illustrated Internet Protocols Reference, Charles M. Kozierok</li> <li>3. TCP / IP Illustrated, Volume 1 - The Protocols, Kevin R. Fall, Vint Cerf, W. Richard Stevens ,2nd Edition ,</li> <li>4. Tananbaum A. S., "Computer Networks", 5th Edition., PHI.</li> <li>5. "Computer Networking: A Top-Down Approach Featuring the Internet", by James F. Kurose and Keith W. Ross</li> </ol>
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

*P. V. Desai*

## M.Sc. (I.C.T.) 1st Semester

### Course: ICT 105: Practical 1

Course Code	ICT 105																								
Course Title	Practical 1																								
Credit	3																								
Teaching per Week	3 Hrs																								
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)																								
Effective From	June 2023																								
Purpose of Course	To provide practical knowledge of web application development using HTML, CSS, JavaScript, ReactJS and jQuery etc.																								
Course Objective	The course prepares students to develop web application frontend using frontend development TML, CSS, JavaScript and JavaScript based frameworks line jQuery and ReactJS.																								
Course Outcomes	CO1 : Students will be able to develop frontend using HTML, CSS and JavaScript. CO2 : Students will be able to practically use JavaScript frameworks like jQuery and ReactJS. CO3 : Students will be able to learn about AJAX, XML, JSON for frontend applications .																								
Mapping between COs with PSOs	<table border="1"><thead><tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th></tr></thead><tbody><tr><th>CO1</th><td></td><td></td><td></td><td></td><td></td></tr><tr><th>CO2</th><td></td><td></td><td></td><td></td><td></td></tr><tr><th>CO3</th><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
	PSO1	PSO2	PSO3	PSO4	PSO5																				
CO1																									
CO2																									
CO3																									
Prerequisite	Object Oriented Programming Concepts and Basic Programming Skills																								
Course Content	Practical based on ICT 101 - Frontend Development using Reactjs																								
Reference Books	NIL																								
Teaching Methodology	Lab Work, Assignment																								
Evaluation Method	30% Internal Assessment 70% External Assessment																								

*P. V. Das*

## M.Sc. (I.C.T.) 1st Semester

### Course: ICT 106: Practical 2

Course Code	106																								
Course Title	Practical 2																								
Credit	3																								
Teaching per Week	3 Hrs																								
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)																								
Effective From	June 2023																								
Purpose of Course	To provide practical knowledge of enterprise application development using Java based APIs, frameworks and controls.																								
Course Objective	The course prepares students to develop web application frontend using frontend development Servlets, JSF, Enterprise Java Beans, JPA and REST and Security API																								
Course Outcomes	CO1 : Students will be able to develop frontend using JSF and Spring Boot. CO2 : Students will be able to practically use JPA, EJB and REST CO3 : Students will be able to learn about Securing and Enterprise Application																								
Mapping between COs with PSOs	<table border="1"><thead><tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th></tr></thead><tbody><tr><th>CO1</th><td></td><td></td><td></td><td></td><td></td></tr><tr><th>CO2</th><td></td><td></td><td></td><td></td><td></td></tr><tr><th>CO3</th><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
	PSO1	PSO2	PSO3	PSO4	PSO5																				
CO1																									
CO2																									
CO3																									
Pre-requisite	Object Oriented Programming Concepts and Core Java																								
Course content	Practical based on the syllabus of ICT 102 – Enterprise Java																								
Reference Books	NIL																								
Teaching Methodology	Lab work, Assignment																								
Evaluation Method	30% Internal Assessment 70% External Assessment																								

*P. V. Desai*



## M.Sc. (I.C.T.) 1<sup>st</sup> Semester

### Course : ICT 107 : Part Time Project 1

Course Code	107																								
Course Title	Part Time Project 1																								
Credit	3																								
Teaching Per Week	3 Hrs																								
Duration	-																								
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)																								
Review/Revision	June 2023																								
Purpose of Course	The project work is introduced to make students implement their theory and practical knowledge they learned during this semester to solve real life problems for software applications.																								
Course Objective	To help students to develop software applications using Java Enterprise Edition and JavaScript based framework(s).																								
Course Outcomes	CO1 : Students will be able to develop multi layered Enterprise Java and JavaScript framework(s) based applications. CO2 : Students will be able to apply Software Engineering concepts to solve real world problems. CO3 : Students will be able to apply database related concepts to design database for the project.																								
Mapping between COs with PSOs	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> </tr> </thead> <tbody> <tr> <th>CO1</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <th>CO2</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> <tr> <th>CO3</th> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> </tr> </tbody> </table>		PSO1	PSO2	PSO3	PSO4	PSO5	CO1						CO2						CO3					
	PSO1	PSO2	PSO3	PSO4	PSO5																				
CO1																									
CO2																									
CO3																									
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.																								
Course Content	<p>The students are required to develop project based on Java Enterprise Edition and JavaScript based framework(s).</p> <p>The students must prepare documentation of the project completed as per the Software Engineering Guidelines.</p> <p>At the end of the semester, the students have to submit their project report in bounded form to the institution.</p> <p>The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.</p> <p>The students have to submit the following reports at the institution:</p> <ol style="list-style-type: none"> <li>1. Project Joining Report</li> <li>2. Project Title Report</li> <li>3. Progress Report</li> <li>4. Project Completion Certificate</li> <li>5. Institution Certificate</li> <li>6. Non disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)</li> </ol>																								
Reference Books	NIL																								
Teaching Methodology	Project guidance, Review																								
Evaluation Method	30% Internal Assessment 70% External Assessment																								

*P. V. [Signature]*