Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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ક્રમાંક : એસ/પરિપત્ર/સિલેબસ/૧૪૪૮૪/૨૦૨૩
તા.૧૪/૦૬/૨૦૨૩

પ્રતિ,
વડાશ્રી,
જે.પી.દાવર ઈન્સ્ટીટયૂટ ઓફ ઈન્ફોર્મેશન
સાયન્સ એન્ડ ટેકનોલોજી,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષય :– એમ..એસસી. (આઈ.સી. ટી.) સેમે.–૧ & ૨ અભ્યાસક્રમ બાબત.

મહાશય,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩ –૨૪ થી અમલમાં આવનાર એમ.એસસી. (આઈ.સી.ટી.)સેમેસ્ટર –૧ અને ૨ નો પેટાસમિતિ ધ્વારા તૈયાર કરવામાં આવેલ પ્રવર્તમાન અભ્યાસક્રમ બાબતેઈન્ફોર્મેશન ટેકનોલોજી વિષયની અભ્યાસ સમિતિની તા.૨૭/૦૩/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ૩ અન્વયે નીચે મુજબ કરેલ ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ આઈ.ટી. વિદ્યાશાખાની તા.૨૭/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૭ અન્વયે કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૦૭/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૧૭ થી સ્વીકારી મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

ઈન્ફોર્મેશન ટેકનોલોજી વિષયની અભ્યાસ સમિતિની તા.૨૭/૦૩/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૩

:: આથી ઠરાવવામાં આવે છે કે,જૂન–૨૦૨૩ થી અમલમાં આવનાર એમ.એસસી. (આઈ.સી.ટી.) સેમેસ્ટર –૧ અને ૨ નો પેટાસમિતિ ધ્વારા તૈયાર કરવામાં આવેલ પ્રવર્તમાન અભ્યાસક્રમમંજૂર કરી તે મંજૂર કરવા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

કોમ્પ્યુટર સાયન્સ એન્ડ આઈ.ટી. વિદ્યાશાખાની તા.૨૭/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૭

:: આથી ઠરાવવામાં આવે છે કે, ઈન્ફોર્મેશન ટેકનોલોજી વિષયની અભ્યાસ સમિતિની તા.૨૭/૦૩/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે કરેલ ભલામણ સ્વીકારી શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર એમ.એસસી. (આઈ.સી.ટી.) સેમેસ્ટર –૧ અને ૨ નો અભ્યાસક્રમ યથાવત સ્વીકારી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૭/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૧૮

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ એન્ડ આઈ.ટી. વિદ્યાશાખાની તા.૨૭/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૭ અન્વયે કરેલ ભલામણ સ્વીકારી મંજૂર કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

કુલસચિવ વતી

પ્રતિ,
૧) અધ્યક્ષશ્રી, કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા.
૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

...તરફ જાણ તેમજ અમલ સારૂ.

એકેડેમિક કાઉન્સિલ તા.07/06/-2023
ઠરાવ નં.....18.....વિદ્યાશાખા/પરિશિષ્ટ.....13.....

પરિશિષ્ટ - 2
પાના નં- 9

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	**PO1 : Fundamental Knowledge Enrichment** 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. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** 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. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** 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. **PO6 : Real World Problem / Project Development** 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. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Students will learn various aspects of Digital Communication Technologies. PSO2 : Students will be able to utilize knowledge of communication technologies in I.C.T. based applications. PSO3 : Students will be able to solve complex programming problems.

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	PSO4 : Students will be able to learn emerging technologies and apply them for the development of Web applications, Mobile applications, IOT applications, etc.... PSO5: Students will develop necessary Entrepreneur and Technical skills to start their own business in I.C.T domain.
Mapping between POs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
PO1					
PO2					
PO3					
PO4					
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
		Theory	Practical		Duration	Marks		
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

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

Course: 101: Application Development using React.js

Course Code	101
Course Title	Application Development using React.js
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, 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	CO1 : Students will be able to learn about frontend development and HTML, CSS and JavaScript. CO2 : Students will be able to learn 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	PSO1 PSO2 PSO3 PSO4 PSO5 CO1 CO2 CO3
Pre-requisite	Basic Programming Skills
Course Content	**Unit 1: Web and frontend Development Fundamentals and HTML** 1.1 Introduction: Web application, Client server architecture 1.2 Frontend, Backend, Fullstack application development 1.3 UI/UX, Search Engine Optimization 1.4 Basics of XML, JSON 1.5 HTML Structure, XHTML 1.6 Links 1.7 Images and ImageMaps 1.8 Tables 1.9 Forms 1.10 Semantic and Non-semantic Elements 1.11 HTML5 Elements and Input types 1.12 Media: audio, embed, source, track, video **Unit 2: CSS Fundamentals** 2.1 Style Sheet Types 2.1.1 Linked 2.1.2 Embedded 2.1.3 Inline 2.2 Style Sheet Precedence 2.3 Style Sheet Syntax 2.4 Using Classes 2.5 Font Control 2.6 Text Control 2.7 Color and Background 2.8 List Box Control 2.9 Miscellaneous Properties 2.9.1 Margin and Padding Properties 2.9.2 Border Properties 2.9.3 Tables 2.10 Multi-Column Layouts

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	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 Typography, 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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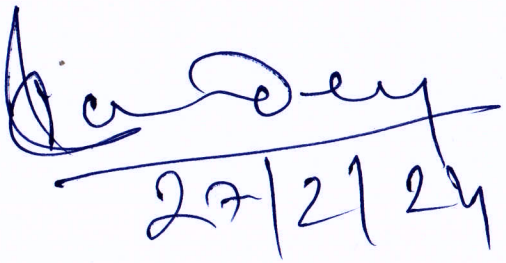
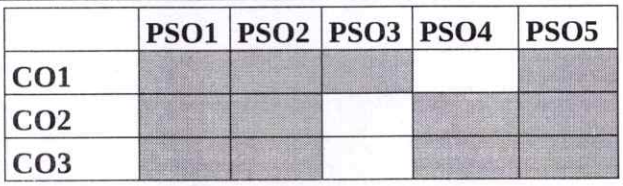
	Unit 5: Developer Tools 5.1 Browser Tools 5.2 UI/UX Tools 5.3 Version Control using Git and others Tools 5.4 Application Deployment
Reference Book	1. JavaScript Bible, 6th Edition – by Danny Goodman, Michael Morrison, Paul Novitski, Tia Gustaff Rayl 2. JavaScript The Complete Reference 3rd Edition - by Thomas A. Powell , Fritz Schneider 3. JavaScript Quick Syntax Reference By Mikael Olsson 4. JavaScript: The Definitive Guide, 6th Edition By David Flanagan - O'Reilly Media 5. Xml: The Complete Reference By Heather Williamson – Tata McGraw-Hill Edition 6. Learning JavaScript, 3rd Edition By Ethan Brown - O'Reilly Media, Inc. 7. Learning jQuery 4th edition, By Jonathan Chaffer, Karl Swedberg 8. Web Development with jQuery, By Richard York – WROX Publication 9. Thomas: HTML & CSS: The Complete Reference, Fifth Edition : TMH: 10. Bootstrap: Jake Spurlock - O'Relly 11. Search Engine Optimization: Harold Davis - O'Relly 12. React Explained: Your Step-by-Step Guide to React, OS Training, LLC 13. Beginning React, Greg Lim 14. Learning React: Functional Web Development with React and Redux, Shroff/O'Reilly 15. Learn React Hooks: Build and refactor modern React.js applications using Hooks, Packt Publishing Limited
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment



M.Sc. (I.C.T.) 1st 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	
Pre-requisite	Understanding of OOPS concept and its implementation by Java Language
Course Content	**Unit 1 : Java EE and SERVLETS** 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 **Unit 2: - Enterprise Java Beans** 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

	Unit 3 -JAVA PERSISTANCE and REST API 3.1 JPA architecture 3.2 ORM with Entities 3.3 Working with Relationships 3.4 Named Queries 3.5 Dynamic Queries AND Native Queries 3.6 REST services with JAX-RS 3.7 Using HTTP Methods in REST 3.8 JERSEY Client for REST Services **Unit -4 ENTERPRISE APPLICATION SECURITY** 4.1 Java EE Security Model 4.2 Credentials and Identity Stores 4.3 Authentication and Authorization Mechanisms 4.4 Data Integrity and Confidentiality 4.5 Securing Enterprise Applications 4.6 JWT based Authorization 4.7 OAuth and OpenIdConnect **Unit 5 : THE JAVA WEB APPLICATION FRAMEWORKS** 5.1 Component Based Framework – JAVA SERVER FACES 5.1.1 Introduction to JSF 5.1.2 Request Processing Lifecycle 5.1.3 JSF Managed Beans 5.1.4 JSF UI Components 5.1.5 JSF Validators and Converters 5.1.6 Event Handling 5.1.7 Composite Components 5.1.8 Templating in JSF 5.1.9 Working with primefaces 5.2 Action Based Framework – SPRING 5.2.1 Introduction to Spring 5.2.2 Lifecycle of Spring MVC 5.2.3 DispatcherServlet 5.2.4 Multiple Controllers 5.2.5 Working with databases 5.2.6 Spring Boot
Reference Book	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 2. Servlet & JSP: A Beginner's Tutorial - Budi Kurniawan, Brainy Software 3. The Definitive Guide to JSF in Java EE 8: Building Web Applications with JavaServer Faces - Bauke Scholtz, Arjan Tijms – Apress 4. Mastering Enterprise JavaBeans and the Java 2 Platform, Enterprise Edition, by Ed Roman 5. Beginning Java™ EE 7 Platform with Payara™ 5: From Novice to Professional by Antonio Goncalves

	6. Mastering JavaServer Faces 2.2 - Anghel Leonard - Packt Publishing 7. Spring in Action 4ed - Craig Walls – Manning 8. Getting Started With Spring Framework: A Hands-on Guide to Begin Developing Applications Using Spring Framework - Ashish Sarin, J Sharma - Createspace Independent Pub 9. Spring 5 Design Patterns - Dinesh Rajput – Packt 10. Learning Spring Boot 2.0 - Greg L. Turnquist - Packt
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc(ICT) 1st 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...
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basic concepts of computer network
Course Content	**Unit 1 : Introduction to Information Security** 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 **Unit 2 : Cryptography** 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 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 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

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	2.3.4 Key Management 2.3.4.1 Key Distribution Scenarios 2.3.4.2 Key Management 2.3.4.3 Diffie Hellman Key Exchange **Unit 3 : Integrity , Authentication and Hash Functions** 3.1 Introduction 3.2 Authentication Requirements & its functions 3.3 Message Authentication 3.3.1 Message Authentication Codes 3.3.2 Hash Functions 3.3.3 MD5, SHA algorithms 3.3.4 Applications of SHA (e.g BlockChain) 3.4 User Authentication 3.4.1 Remote User Authentication Principles 3.4.2 Remote User Authentication using Symmetric Encryption 3.4.3 Kerberos 3.5 Digital Signatures and Authentication Protocols 3.5.1 Introduction to digital signatures 3.5.2 Authentication Protocols 3.5.3 Digital Signature Standard **Unit 4 : Network /IP Security** 4.1 IP Security Overview 4.2 Security in IPV4 and IPV6, Trade off involved 4.3 Encapsulating Security Payload 4.4 Security Associations 4.5 Internet Key Exchange 4.6 Cryptographic Suites 4.7 Firewalls 4.8 Biometrics **Unit 5 : Transport and Application Layer Security** 5.1 Web Security Issues 5.2 Secure Socket Layer(SSL) 5.3 Transport Layer Security 5.4 HTTPS 5.5 Secure Shell 5.6 Email Security: PGP,SMIME
Reference Book	1. Cryptography and Network Security – Principles and Practice – William Stallings- Seventh Edition- Pearson Publication 2. Cryptography and Network Security- Behrouz A. Forouzan – McGrawHill Publication 3. Modern Cryptography, Theory & Practice -Wenbo Mao-Pearson Education 4. Information Security: Theory and Practice – Dhiren R. Patel – PHI 5. Cryptography and Network Security – Atul Kahate - 4th Edition - McGrawHill Publication
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc(ICT) 1st 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	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Prerequisite	Basic concepts of computer network
Course Content	**Unit 1 : Introduction** 1.1 Internet Protocols and Standards 1.1.1 History 1.1.2 Protocols & Standards 1.1.3 Standards & Organizations 1.1.4 Internet Standards 1.1.5 Internet Administration 1.2 Overview of OSI Model and TCP/IP Model **Unit 2 : Overview of physical and data link layer** 2.1 Overview of Network Topologies 2.2 Overview of Data Link Layer Protocols 2.3 Functions of Data Link Layer **Unit 3 : Network Layer & Protocols** 3.1 IP addressing 3.1.1 IP Classfull addressing 3.1.1.1 Subnetting, Supernetting 3.1.2 IP Classless addressing 3.1.2.1 Variable length blocks 3.1.2.2 Subnetting 3.2 Special Addresses 3.3 Delivery, Formatting and Routing 3.4 ARP and RARP 3.5 Internet Protocol (IP) 3.5.1 Datagram 3.5.2 Fragmentation 3.5.3 Options 3.5.4 Checksum 3.5.5 IP Package

P. M Das

	3.6 ICMP 3.7 IGMP 3.8 Mobile IP 3.8.1 Addressing 3.8.2 Agents 3.8.3 Three Phases 3.8.4 Inefficiency in Mobile IP 3.9 Introduction to IPv6 3.9.1 Representation 3.9.2 Address Space, Address space allocation 3.9.3 Auto Configuration, Renumbering 3.9.4 Transition from IPV4 to IPV6 3.9.5 IPV6 Protocol 3.9.5.1 Packet Format, Extension Header **Unit 4 : Transport Layer** 4.1 Transport Layer Services 4.2 Transport Layer Protocols 4.2.1 UDP 4.2.1.1 User Datagram 4.2.1.2 Checksum 4.2.1.3 UDP Operations 4.2.1.4 Use of UDP 4.2.2 TCP 4.2.2.1 TCP Services 4.2.2.2 TCP Features 4.2.2.3 TCP Segment 4.2.2.4 Format 4.2.2.5 Encapsulation 4.2.2.6 TCP Connection 4.2.2.7 State Transition Diagram 4.2.2.8 Flow Control 4.2.2.9 Error Control 4.2.2.10 Congestion Control 4.2.2.11 TCP Timers 4.2.2.12 TCP Options **Unit 5 : Application Layer** 5.1 Introduction 5.2 Client Server Paradigm 5.3 DNS 5.4 SNMP 5.5 Electronic Mail (SMTP, POP3, MIME, IMAP) 5.6 WWW & HTTP 5.7 File Transfer: FTP & TFTP 5.8 Remote Login: TELNET 5.9 Host Configuration : BOOTP & DHCP
Reference Book	1. Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 4th Edition 2. TCP/IP Guide – A Comprehensive, Illustrated Internet Protocols Reference, Charles M. Kozierok 3. TCP / IP Illustrated, Volume 1 - The Protocols, Kevin R. Fall, Vint Cerf, W. Richard Stevens ,2nd Edition , 4. Tananbaum A. S., "Computer Networks", 5th Edition., PHI. 5. "Computer Networking: A Top-Down Approach Featuring the Internet", by James F. Kurose and Keith W. Ross
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

<table>
<tr><td>Course Code</td><td>ICT 105</td></tr>
<tr><td>Course Title</td><td>Practical 1</td></tr>
<tr><td>Credit</td><td>3</td></tr>
<tr><td>Teaching per Week</td><td>3 Hrs</td></tr>
<tr><td>Minimum weeks per Semester</td><td>15 (Including Practical Work, examination, preparation, holidays etc.)</td></tr>
<tr><td>Effective From</td><td>June 2023</td></tr>
<tr><td>Purpose of Course</td><td>To provide practical knowledge of web application development using HTML, CSS, JavaScript, ReactJS and jQuery etc.</td></tr>
<tr><td>Course Objective</td><td>The course prepares students to develop web application frontend using frontend development TML, CSS, JavaScript and JavaScript based frameworks line jQuery and ReactJS.</td></tr>
<tr><td>Course Outcomes</td><td>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 .</td></tr>
<tr><td>Mapping between COs with PSOs</td><td><table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Pre-requisite</td><td>Object Oriented Programming Concepts and Basic Programming Skills</td></tr>
<tr><td>Course Content</td><td>Practical based on ICT 101 - Application Development using Reacjs</td></tr>
<tr><td>Reference Books</td><td>NIL</td></tr>
<tr><td>Teaching Methodology</td><td>Lab Work, Assignment</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal Assessment
70% External Assessment</td></tr>
</table>

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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 entrprise 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	
Pre-requisite	Object Oriented Programming Concepts and Core Java
Course content	Practical based on the syllabus of ICT 102 – Enterprise Java
Referenece Books	NIL
Teaching Methodology	Lab work, Assignment
Evaluation Method	30% Internal Assessment 70% External Assessment

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

M.Sc. (I.C.T.) 1st 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	
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Content	The students are required to develop project based on Java Enterprise Edition and JavaScript based framework(s). The students must prepare documentation of the project completed as per the Software Engineering Guidelines. At the end of the semester, the students have to submit their project report in bounded form to the institution. The Project Presentation and Viva – Voce will be conducted as per the University exam schedule. The students have to submit the following reports at the institution: 1. Project Joining Report 2. Project Title Report 3. Progress Report 4. Project Completion Certificate 5. Institution Certificate 6. Non disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

M.Sc. (I.C.T.) 2nd Semester

Course : 201 : Blockchain Computing

Course Code	ICT 201
Course Title	Blockchain Computing
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 learn the concepts of Blockchain, cryptocurrencies and smart contracts.
Course Objective	To introduce the comprehensive concepts of Blockchain and it's transactions. At the end of this course, a student will be able to comprehend the fundamental concepts required for usage of Blockchain.
Course Outcomes	CO1 : Students will be able to learn technical foundations of Blockchain technology CO2 : Students will be able to understand bitcoin, ethereum cryptocurrency and the transactions CO3 : Students will be able to understand the concepts of Smart Contracts and NFT
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Basics of ISA and Java

Course Content	**Unit 1. Introduction to Blockchain** 1.1 Understanding Blockchain 1.2 The growth of Blockchain Technology 1.3 Distributed systems 1.4 History of Blockchain 1.5 Common Misconceptions 1.6 Cryptographic hash 1.7 Digital Signature 1.8 Merkle Tree **Unit 2. Building Blockchain** 2.1 Essentials of Blockchain 2.2 Blockchain architecture 2.3 Generic elements of a Blockchain 2.4 Types of Blockchain 2.5 Consensus

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2.5.1 Byzantine Fault

2.5.2 Proof of Work

2.5.3 Proof of Stake

2.5.4 Double-spending

2.6 Creating blocks and links

2.7 Inserting Hashes

2.8 Forking in block chain

Unit 3.Smart contract based Blockchains – A case of Ethereum Blockchain

3.1 Overview of Ethereum

3.2 Ethereum network

3.3 Ethereum structure

3.4 Proof of Stake

3.5 Smart contracts

3.6 Ether and gas points

3.7 Ethereum operations

3.8 Ethereum wallets

3.9 Mining Ether

3.10 Decentralized Autonomous Organization (DAO) and Decentralized Finance

3.11Creating Smart Contracts using Solidity

Unit 4. Web 3.0 and Hyperledger

4.1 Introduction to Web 3.0

4.1.1 Development Frameworks

4.1.2 Decentralize Applications (DApps)

4.2 Hyperledger as a Protocol

4.2.1 Reference Architecture

4.2.2 Hyperledger Fabric

4.2.3 Distributed Ledger

Unit 5. NFT (Non Fungible Tokens) and Other Use Cases of Blockchain

5.1 NFT

5.1.1 Introduction to NFT

5.1.2 Difference between NFT and cryptocurrency

5.1.3 Types of NFT

5.1.4 Creating,buying and selling NFT

5.1.5 Impact of NFT on environment

5.1.6 NFT Usage and Rights

5.1.7 Innovative and popular NFT

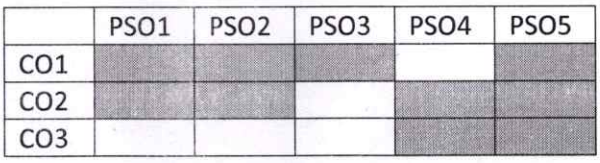
5.2 Use Cases

5.2.1 Financial technology

	5.2.2 Real Estate 5.2.3 Insurance 5.2.4 Governance 5.2.5 Other industries
Reference Books	1. Mastering Blockchain,Imran Bashir, Packt Publisher 2. Blockchain for dummies, Tiana laurence, Wiley 3. Bitcoin and Cryptocurrency Technologies: Arvind narayaran, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Priceton university press 4. Blockchain Applications: A Hands-On Approach , Arshdeep Bahga ,Vijay Madisetti - VPT 5. Metaverse For Beginners 2022 The Ultimate Guide on Investing In Metaverse, Blockchain Gaming, Virtual Lands, Augmented Reality, Virtual Reality, NFT, Real Estate, Crypto And Web 3.0, Justin Sonnen 6. Mastering Ethereum Building Smart Contracts and DApps, Andreas Antonopoulos, Gavin Wood, O'Reilly 7. Mastering BitCoin 2/ED programming the open blockchain, Andreas M. Antonopoulos, O'Reilly 8. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects, Elad Elrom, Apress 9. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly 10. Blockchain: The Blockchain For Beginners Guide To Blockchain Technology And Leveraging Blockchain Programming, Josh Thompsons 11. The NFT Handbook: How to Create, Sell and Buy Non-Fungible Tokens, QuHarrison Terry, Matt Fortnow, Wiley
Teaching Methodology	Lectures, Discussion, Self Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment
Tools	1. Solidity Compiler 2. Tools and libraries 3. Remix 4. Local test node : Pythereum, Ganache 5. Code Analysers: Solium,Open Zeppelin 6. Browsers: Mist,Metamask

M.Sc. (I.C.T.) 2nd Semester

Course : ICT 202 : Application Development using .NET Core

Course Code	ICT 202
Course Title	Application Development using .NET Core
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 helps students to understand and use .NET advanced concepts for real world .NET applications.
Course Objective	To impart knowledge of Enterprise application development using .NET Core.
Course Outcome	CO1: Students will be able to understand and learn object-oriented concepts using C#.NET Core and web application development using ASP.NET Core MVC architecture. CO2: Students will be able to learn and develop RESTful web services and web API using .NET Core. CO3: Students will be able to learn and implement LINQ and database integration using C#.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Fundamental, ADO.NET, Basic Web Development Concepts.
Course Content	**Unit : 1 : Introduction to .NET Core and C#** 1.1. .NET Framework 1.1.1 .NET Framework architecture 1.1.2 Common Language Runtime 1.1.3 Common Type System 1.1.4 Common Language Specification 1.1.5 Microsoft Intermediate Language 1.1.6 Framework Class Libraries 1.2. .NET Core 1.2.1 .NET Core Architecture 1.2.2 Difference between .NET Core and .NET Framework 1.2.3 Advantages of .NET Core 1.3. Assemblies and Namespaces 1.4. Overview of C#.Net CORE 1.5. .NET CORE Assemblies and Libraries 1.6. Data Types 1.7. Variables and Constants 1.8. Operators 1.9. Flow Control 1.10. Program Structure 1.11. Application Configuration **Unit : 2 : Programming using C# .NET Core**

2.1. Classes and Structure
2.2. Construction and Disposal of object
2.3. Inheritance
2.4. Method Overloading
2.5. Operator Overloading
2.6. Interfaces
2.7. Exception & Error Handling
2.8. Threads and AppDomains
2.9. Delegates
2.10. Events
2.11. Reflection
2.12. Serialization
2.13. Attributes and Annotations
2.14. Pattern Matching
2.15. Tuples and Deconstruction
2.16. Local/Nested Functions
2.17. Expression Bodied Members

Unit : 3 : Collections and LINQ

3.1. Collections
3.2. Indexers
3.3. Generics
3.4. LINQ Language Features
3.5. Object Initialization
3.6. Anonymous Types
3.7. Implicitly Typed Local Variables
3.8. Lambda Expression
3.9. Query Expression
3.10. LINQ to Objects
3.11. LINQ to XML
3.12. LINQ to SQL
3.13. LINQ to Entities

Unit : 4 : ASP.NET CORE MVC

4.1. Introduction to ASP.NET Core
4.2. Multiple Environments and Development Mode
4.3. MVC Architectural Pattern
4.4. URL Routing Engine
4.5. Routing Configuration
4.6. Wiring Controller, Model, and View
4.7. Data Access and Modeling
4.8. TempData, ViewBag and ViewData
4.9. NuGet Package
4.10. Dependency Injection
4.11. Asynchronous Programming
4.12. Action Filters
4.13. Security and Identity
4.14. Unit Testing and ASP.NET MVC
4.15. Self hosting of Web Applications
4.16. Working with SQL and No-SQL Data Storage Types

Unit : 5 : RESTFul Services

5.1 Introduction to Web Services
5.2 RESTful API
5.3 Working with .NET Application

	5.4 Working with RESTful Services 5.5 Testing and Consuming Web API 5.6 Configuring Web API for Cross-Platform
Reference Book	1. C# The Basics by Vijay Mukhi : BPB 2. C# Essentials by Ben Albabari : O'Reilly 3. Professional C# by Simon Robinson : Wrox 4. LINQ Pocket Reference: Learn and Implement LINQ for .NET Applications by Joseph Albahari, Ben Albahari, O'Reilly 5. Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd 6. Enterprise Application Architecture with .NET Core by Ganesan Senthilvel, Ovais Mehboob Ahmed Khan, Habib Ahmed Qureshi, Packt Publishing Ltd. 7. ASP.NET MVC with Entity Framework and CSS by Lee Naylor, APress 8. Pro ASP.NET Core MVC by Adam Freeman, Springer 9. Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd 10. Murach's ASP.NET Core MVC by Mary Delamater, Joel Murach, Mike Murach & Associates, Inc
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M. Sc. (I.C.T.) 2nd Semester

Course: ICT 203 Elective 1: Smart Device Computing Using iOS

Course Code	ICT 203 Elective 1
Course Title	Smart Device Computing Using iOS
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	The Purpose of course is to help understanding the components and structure of mobile application development using iOS. The course also provides students with the skills necessary to develop an iOS App from scratch to deploying it on the Apple Store.
Course Objective	The objective of the course is to impart knowledge of Swift and Apple iOS application Design and Development.
Course Outcomes	CO1 : Students will be able to understand Apple based smart device application development CO2 : Students will be able to learn about various components of iOS application development tools CO3 : Students will be able to publish iOS application on Apple store.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Object Oriented Programming knowledge.
Course Content	**Unit 1 : Introduction to iOS with Swift Language** 1.1. Introduction iOS and iOS Architecture 1.1.1. Foundation Framework 1.1.2. Cocoa Framework 1.2. Introduction to Xcode IDE 1.2.1. Setting up Development Environment 1.2.2. Xcode Development Tools – Interface Builder and Simulator 1.2.3. Testing and Debugging 1.3. Introduction to Swift 1.3.1. Datatypes, Variables in Swift 1.3.2. Tuples, Constants, Literals in Swift 1.3.3. Working with Strings in Swift 1.4. Optionals in Swift - Implicit and Explicit 1.5. Collections in Swift 1.5.1. Dictionaries, Arrays, and Sets 1.6. Control Flows and Functions in Swift 1.7. Object Oriented Programming in Swift 1.7.1. Custom Class and Instance Creation 1.7.2. Inheritance and Polymorphism 1.7.3. Initializers in swift 1.8. Protocols and Extensions 1.9. Information Property List File and App Permissions **Unit 2 : iOS Design Patterns** 2.1 Introduction to Storyboard 2.2 Introduction to UIView, UIWindow and UIViewController 2.3 Model View Controller (MVC) Pattern in Interface Design 2.4 Application Life Cycle and View Controller Life Cycle 2.5 Storyboard and Interface builder 2.6 Working with Basic UIElements 2.6.1 UILabel, UIButton, UITextFeild, UIImageView etc. 2.7 IBActions and IBOutlets

	2.8 Auto Layout Constraints to create Adaptive UI 2.9 UIAnimation 2.9.1 Animation using Auto Layout Constraints 2.9.2 Animation with UIImageView 2.10 Recognizing and Handling Gestures 2.10.1 Working with different types of Gestures 2.10.2 Gestures with UIElements **Unit 3 : UIControls in iOS** 3.1 Navigation Controller and its Usage 3.2 Navigation Techniques 3.2.1 Segue, Push, Pop, Present and Dismiss 3.3 Working with TableView 3.3.1 Static TableViewController 3.3.2 Dynamic TableView 3.4 Working with PickerView 3.5 Working with Miscellaneous Controls in iOS 3.5.1 UICollectionView 3.5.2 UITabBarController 3.5.3 UIScrollView 3.5.4 UIWebView 3.5.5 ContainerView 3.6 Working with AlertController and its Types **Unit 4 : Data Persistence and Data Manipulation Techniques** 4.1 Working with UserDefaults for data persistence 4.2 Introduction to FileManager 4.3 Frameworks and Library Configurations 4.4 Data Persistence Techniques 4.4.1 SQlite Framework 4.4.2 Core Data Framework 4.5 Data Manipulation Techniques 4.5.1 JSON Parsing 4.5.2 XML Parsing **Unit 5 : Advance Programming in iOS** 5.1 API intergation 5.2 Location based Services 5.1.1. Core Location Services 5.1.2. CLLocation and CLLocationManager Classes 5.1.3. MapKit, MapView and MKPointAnnotation 5.1.4. Location Based Call-outs 5.3 Introduction to the working of Push Notifications 5.4 Publishing iOS App to Apple Store 5.5 Introduction to CoreML 5.6 Introduction to SwiftUI
Reference Book:	1. Swift Programming: The Big Nerd Ranch Guide (2nd Edition) (Big Nerd Ranch Guides) 2nd Edition by Matthew Mathias (Author), John Gallagher (Author) 2. Swift: A Comprehensive Intermediate Guide to Learn and Master the Concept of Swift Programming Kindle Edition by MG Martin (Author) 3. iOS 12 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics 1st Edition by Matt Neuburg (Author) 4. Classic Computer Science Problems in Swift: Essential Techniques for Practicing Programmers1st Edition by David Kopec 5. iOS Programming: The Big Nerd Ranch Guide, by Christian Keur and Aaron Hillegass 6. Beginning Swift by Rob kerr and Kare Morstol, Packt Publication
Teaching Methodology:	Lectures, Discussion, Independent Study, Hands-on-Session, Seminars and Assignment
Evaluation Method:	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 2nd Semester

Course : ICT 203 : Smart Device Computing Using Android

Course Code	ICT 203 Elective 2
Course Title	Smart Device Computing Using Android
Credit	4
Teaching per Week	4 Hrs
Last Review / Revision	June 2023
Purpose of Course	This course helps students to understand android based smart device application development. The course also gives students an idea about various components of Android application development tools.
Course Objective	The objective of the course is to provide a thorough introduction to the Android environment, Tools for creating Android applications, The Android approach to structuring applications, Basic user interfaces, and Application life cycles.
Course Outcomes	CO1 : Students will be able to understand android based smart device application development CO2 : Students will be able to learn about various components of Android application development tools CO3 : Students will be able to publish Android application on Google play store.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Object Oriented Programming knowledge
Course Content	**Unit : 1 : Introduction to Kotlin** 1.1 Kotlin Overview 1.2 Environment setup in Android Studio 1.3 Variables, Data types, Arrays, Array list in Kotlin 1.4 Operators in Kotlin 1.5 Control flow statements in Kotlin 1.6 Loops in Kotlin 1.7 Functions and Lambda expressions in Kotlin 1.8 Object Oriented Programming in Kotlin **Unit : 2 : Android Application development** 2.1 Android Application architecture 2.2 AVD, Gradle, Manifest, Resources 2.3 Android Activity and Activity lifecycle 2.4 Android Views and Layouts 2.5 Button, TextView,ImageButton, EditText, CheckBox, ToggleButton, RadioButton, Spinne, etc... 2.6 Event Handling in Kotlin 2.7 AutoCompleteTextView View 2.8 User Interactions - Toast, Dialog, Menus - Types of Menus 2.9 List & Views(RecyclerView, Card View, etc...) 2.10 Intents& Intent Life Cycle - Types of Intentts 2.11 Navigation between screens 2.12 Tabs and Fragments

	Unit : 3 : Working with Data and Background Services 3.1 Shared preferences 3.2 Internal and External storage 3.3 Android Database Design considerations 3.4 Working with SQLite database 3.5 CRUD operations on SQLite 3.6 Working with Firebase - CRUD operations 3.7 Content Provider 3.8 Background Services and its Life cycle 3.9 Working with multi-threading and AsyncTask 3.10 Broadcast Receivers **Unit : 4 : Working with Google Play Services and API** 4.1 Location Navigation 4.2 Geocoding and Reverse Geocoding Notifications 4.3 Working with Google Maps API 4.4 Working with Rest API and Retrofit Library 4.5 Working with web Services 4.6 Google Cloud messaging **Unit : 5 : Advanced Android Programming** 5.1 Android property animations 5.2 Push notification with Firebase 5.3 API integration 5.4 Cloud storage with Firebase 5.5 XML and JSON Parsing 5.6 Working with Coroutines 5.7 Testing and Debugging Android Application 5.8 Publishing Apps 5.9 Introduction to Material design
Reference Book	1. Android Programming with Kotlin for Beginners, by John Horton, Packt publication 2019 2. Learn Kotlin for Android Development by Peter Spath, Apress publication, 2019 3. Head First Kotlin - a brain friendly guide by Dawn Griffiths and David Griffiths, O'Reilly publication 2019 4. Learn Android Studio 3 with Kotlin by Ted Hagos, Apress publication, 2018 5. Kotlin In-Depth by Aleksei Sedunov, BPB publications, 2020 6. Mastering Kotlin by Nate Ebel, Packt publication 2019
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 2nd Semester

Course: 204: Digital Communication

Course Code	204
Course Title	Digital Communication
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2023
Purpose of Course	This course provides in depth knowledge of mobile communication architecture and wireless communication technologies.
Course Objective	To make student understand Mobile technology architecture, its components and Wireless communication technology.
Course Outcomes	CO1 : Students will be able to understand data, signals and transmission media. CO2 : Students will be able to analyze various transmission media, data encoding, modulation and multiplexing techniques. CO3 : To impart knowledge about cellular communication, wireless enterprise and new generation mobile services.
Mapping between COs with PSOs	
Pre-requisite	Fundamental knowledge of network communication
Course Outcome	This course enables students to understand mobile communication. This course will also help students to understand the role of various wireless communication systems and select particular type of communication technology for their application development.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course Content	Unit : 1 : Introduction of communication system 1.1 Introduction of Electronic communication System 1.2wave property and characteristics. 1.3 electromagnetic spectrum, bandwidth and information capacity 1.4 signal analysis 1.5 introduction of sensor, Analog to digital conversion and digital to analog conversion 1.6 Pulse code modulation(PCM) 1.7 digital modulation and transmission techniques(ASK,FSK,PSK) Unit : 2 : multiplexing techniques and Network switching 2.1 FDMA 2.2 TDMA 2.3 WDM 2.4circuit and data(Packet) mode, circuit switching, packet switching 2.5 introduction of transmission media Unit : 3 : Cellular communication systems 3.1 Mobility, Mobile and Ubiquitous computing 3.2 Global System for Mobile Communication (GSM) system overview: 3.2.1 Cellular concept 3.2.2 GSM Architecture 3.2.3 Frequency Reuse Planning and Design 3.2.4 Mobility Management(Hard Handoff) 3.3 General Packet Radio Service (GPRS) architecture and working 3.4 Wireless Local Loop (WLL) 3.5 introduction of 3G technology 3.5.1 introduction of CDMA 3.5.2 Frequency Allocation 3.5.3 Soft Handoff 3.6 Introduction of satellite communication Unit : 4 : Wireless Enterprise networks 4.1 Bluetooth technology 4.2 RFID technology 4.3 Mobile IP 4.4 Infrared communication technology 4.5 Wireless sensor networks 4.6 WIFI, WIMAX Technology Unit : 5 : New Generation Mobile Services 5.1 Introduction to 4G technology 5.2 Introduction to 5G technology 5.3 introduction of Internet of Things. 5.4 IoT/M2M Applications

Reference Book	1. 5G Mobile Core Network, Rajaneesh Shetty, Apress publication 2. Industry 4.0 the industrial internet of things,Alasdair Gilchrist,Apress publication 3. Introduction to Wireless and Mobile System, Darma Prakash agrawal, Qing-An Zeng, Cengage Publication 4. Mobile Computing, Asokek Talukder, Hasan Ahmed, Roopa Yavagal, MC Graw Hill Publication 5. Embedded systems- concepts, Design and Programming, Parag Dave, Himanshu B. Dave, Pearson Publication 6. Wireless And Mobile Communication, T.G.Palanivelu, PHI publication 7. Mobile and Personal communication systems and services, Raj pandya, PHI 8. Principles of Wireless Networks,Kavesh Pahlavan,Prashant Krishnamurti, Pearson Edition 9. Wireless and Mobile Network Architectures,Yi-Bing Lin & Imrich Chlamtac,John Wiely &sons, 10. Guide to Designing and Implementing Wireless LANs; Mark Ciampa,Thomson Learning Vikas Publishing house 11. The Wireless Application Protocol Sandip singhal, Pearson edition 12. Embedded real time system K.V.K.K. Prasad Dreamtech press 13. Adhoc Wireless Networks C.Siva Ram Murthy, B.S.Manoj Pearson Education 14. Data communication and Networking, Behrouza A forouzan, Mc Graw Hill publication
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

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

Course : ICT 205 : Practical 3

<table>
<tr><td>Course Code</td><td>205</td></tr>
<tr><td>Course Title</td><td>Practical 3</td></tr>
<tr><td>Credit</td><td>3</td></tr>
<tr><td>Teaching Per Week</td><td>3 Hrs</td></tr>
<tr><td>Minimum Weeks Per Semester</td><td>15 (Including Practical Work, Examination, Preparation, Holidays etc.)</td></tr>
<tr><td>Review/Revision</td><td>June 2023</td></tr>
<tr><td>Purpose of Course</td><td>The course provides practical knowledge of C#, LINQ, .NET Core and MVC.</td></tr>
<tr><td>Course Objective</td><td>The course prepares students to develop .NET Core based applications.</td></tr>
<tr><td>Course Outcomes</td><td>CO1 : Students will be able to develop applications using C#.NET core.
CO2 : Students will be able to develop web applications using ASP.NET MVC core.
CO3 : Students will be able to develop web applications using RESTful web API.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td><table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Prerequisite</td><td>Object Oriented Programming Concepts</td></tr>
<tr><td>Course Outcome</td><td>After completion of this course, students will be able to develop .NET Core based applications.</td></tr>
<tr><td>Course Content</td><td>Practical based on Paper No. 202 - Application Development using .NET Core.</td></tr>
<tr><td>Reference Books</td><td>NIL</td></tr>
<tr><td>Teaching Methodology</td><td>Lab Work</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal Assessment
70% External Assessment</td></tr>
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M.Sc. (I.C.T.) 2nd Semester

Course: 206: Practical 4

Course Code	**206**
Course Title	**Practical 4**
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	The course provides practical knowledge of application development for smart devices using iOS or Android.
Course Objective	The course prepares students to develop applications for smart devices using iOS or Android.
Course Outcomes	**Elective 1** CO1 : Students will be able to develop simple applications with playground tools in XCode. CO2 : Students will be able to develop GUI applications with XCode IDE. CO3 : Students will be able to develop location based services using various frameworks. **Elective 2** CO1 : Students will be able to develop android applications using the latest design concepts, controls and components. CO2 : Students will be able to develop applications using the local database-SQLite and integrate web services in android. CO3 : Students will be able to create applications using background services, location services, google maps, etc.
Mapping between COs with PSOs	
Pre-requisite	Basic Object Oriented Programming Concepts
Course Contents	Practical based on elective Paper No. 203 – (Elective I : Smart Device Computing Using iOS or Elective II : Smart Device Computing Using Android).
Reference Books	Nil
Teaching Methodology	Lab Work, Assignment
Evaluation Method	30 % Internal Assessment 70% External Assessment

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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

Course : ICT 207 : Part Time Project 2

<table>
<tr><td>Course Code</td><td>207</td></tr>
<tr><td>Course Title</td><td>Part Time Project 2</td></tr>
<tr><td>Credit</td><td>3</td></tr>
<tr><td>Teaching Per Week</td><td>3 Hrs</td></tr>
<tr><td>Duration</td><td>-</td></tr>
<tr><td>Minimum Weeks Per Semester</td><td>15 (Including Practical Work, Examination, Preparation, Holidays etc.)</td></tr>
<tr><td>Review/Revision</td><td>June 2023</td></tr>
<tr><td>Purpose of Course</td><td>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.</td></tr>
<tr><td>Course Objective</td><td>To help students to develop software applications using .NET, Mobile Technology and popular JavaScript based frameworks.</td></tr>
<tr><td>Course Outcomes</td><td>CO1 : Students will be able to develop project(s) using .NET technology and Mobile Technology.
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(s).</td></tr>
<tr><td>Mapping between COs with PSOs</td><td><table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Prerequisite</td><td>Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.</td></tr>
<tr><td>Course Content</td><td>The students are required to develop project(s) using .NET, Mobile Technology and popular JavaScript based frameworks.
The students must prepare documentation of the project completed as per the Software Engineering Guidelines.
At the end of the semester, the students have to submit their project report in bounded form to the institution.
The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.
The students have to submit the following reports at the institution:
1. Project Joining Report
2. Project Title Report
3. Progress Report
4. Project Completion Certificate
5. Institution Certificate
6. Non disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)</td></tr>
<tr><td>Reference Books</td><td>NIL</td></tr>
<tr><td>Teaching Methodology</td><td>Project guidance, Review</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal Assessment
70% External Assessment</td></tr>
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