VEER NARMAD SOUTH GUJARAT UNIVERSITY

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

ક્રમાંક : એકે./પરિપત્ર/૧૦૦૩૭/૧૯
તા.૧૭/૦૬/૨૦૧૯

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

વિષય :– એમ.એસસી (આઈ.સી.ટી) સેમેસ્ટર–૧ અને ૨ ના અભ્યાસક્રમ બાબત.

સુજ્ઞશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર એમ.એસસી.(આઈ.સી.ટી) સેમેસ્ટર–૧ અને ૨ ના અભ્યાસક્રમ અંગે ઈન્ફોર્મેશન ટેકનોલોજી વિષયની એડહોક (નિયૂકત) સમિતિની તા.૦૯/૧/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે કરેલ નીચેની ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાએ તેની તા.૨૯/૦૪/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે સ્વીકારી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલે તેની તા. ૦૭/૦૬/૨૦૧૯ ની સભાના ઠરાવ ક્રમાંક : ૩૫ અન્વયે મંજૂર કરેલ છે, તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

ઈન્ફોર્મેશન ટેકનોલોજી વિષયની એડહોક(નિયૂકત) સમિતિની તા.૯/૧/૨૦૧૯ ભલામણ ક્રમાંકઃ ૩

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦૨૦ થી અમલમાં આવનાર એમ.એસસી(આઈ.સી.ટી) સેમેસ્ટર–૧ અને ૨ નો પેટાસમિતિ ધ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમને ચર્ચા વિચારણા કર્યા બાદ સર્વાનુમતે મંજૂર કરી કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાને મંજુર કરવા ભલામણ કરવામાં આવે છે.

કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૨૯/૦૪/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૩

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦૨૦ થી અમલમાં આવનાર એમ.એસસી (આઈ.સી.ટી) સેમેસ્ટર–૧ અને ૨ નો પેટાસમિતિ ધ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ સ્વીકારી મંજૂર કરવામાં આવે છે. અને તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૭/૦૬/૨૦૧૯ની સભાનાં ઠરાવ ક્રમાંકઃ ૩૫

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦૨૦ થી અમલમાં આવનાર એમ.એસસી (આઈ.સી.ટી) સેમેસ્ટર–૧ અને ૨ નો અભ્યાસક્રમ સ્વીકારી મંજૂર કરવામાં આવે છે.

ઈ.ચા.કુલસચિવ

બિડાણ : ઉપર મુજબ

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.

Re-Accredited by NAAC with 'A' Grade
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.
Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Fax : +91 - 261 - 2227312
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

No./Circular/10037/19
Date- 17-6-2019

The Head
J.P.Dawer Institute of Information Science and Technology
VNSGU
Surat

Subject: Regarding the syllabus revision M.Sc.I.C.T of Sem.1 and Sem.2

This is to notify that the syllabus of M.Sc.I.C.T Sem.1 and Sem.2 to be enforced from the Academic year 2019-20 has been recommended by the Adhoc(appointed) Committee of Information Science and Technology dated 9-1-2019 Resolution No.2 to the Faculty of Information Science and Technology which has been accepted on 29-4-2019, Resolution No.2 and send for approval to the Academic Council. The same has been approved by Academic Council dated 07-06-2019, Resolution No.35 and the related teachers and students are informed hereby and, this shall be in effect now onwards.

Recommendations by the Adhoc Committee of Information Science and Technology dated 9-1-2019 , Resolution No.3

This is to notify that the syllabus of M.Sc.I.C.T Sem.1 and Sem.2 framed by the sub-committee to be enforced from 2019-20 should be unanimously accepted after discussion and is recommended for further approval to the Faculty of Information Technology.

Recommendations made by the Faculty of Information Science and Technology dated 29-4-2019 Resolution No.3

This is to notify that the syllabus of M.Sc.I.C.T Sem.1 and Sem.2 framed by the sub-committee to be enforced from 2019-20 is accepted and is recommended for approval to the Academic Council.

Resolution 35 of the Academic Council committee dated 7-6-2019

This is to notify that the syllabus of M.Sc.I.C.T Sem.1 and Sem.2 framed by the sub-committee to be enforced from 2019-20 is accepted and approved.

Enclosure: As Above

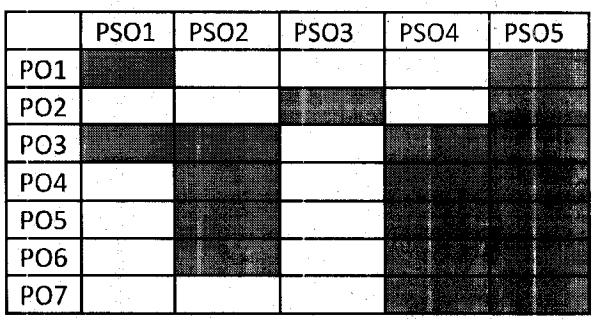
I/C Registrar

1.Dean, Faculty of Information Science and Technology
2.Exam Controller, VNSGU (Do the further needful)
Translated from Gujarati to English

I/C Registrar
Veer Narmad South Gujarat University
SURAT.

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 resource 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 project provides 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. 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	Java Web Development	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	C#.NET	4	0	4	3 Hrs	70	30	100
ICT 202	Advanced .NET	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

એકેડેમિક કાઉન્સિલ તા.09/05/2019 (ઠરાવ-3)
બાબત.....૩૮.....વિદ્યાપરિષદ.....

Master of Science (Information & Communication Technology)

Name of Program	Master of Science (Information and Communication Technology)
Abbreviation	M.Sc. (I.C.T.)
Duration	2 years
Eligibility	Graduate in the discipline of computer application / computer science / computer engineering / Information Science / Information Technology
Objective of Program	To prepare human resource for cutting edge technologies in the field of ICT.
Program Outcome	After the completion of the course, students will be able to develop and manage various types of projects in the field of ICT.
Effective From	June 2019

Program Structure		M.Sc. (I.C.T.) – Semester 1 (M.Sc. (I.C.T.) 2 years PG Course)						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
ICT101	Java Web Development	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		M.Sc. (I.C.T.) – Semester 2 (M.Sc. (I.C.T.) 2 years PG Course)						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
ICT 201	C#.NET	4	0	4	3 Hrs	70	30	100
ICT 202	Advanced .NET	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
Program Passing Rules		As per University rules						

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

Course: 101: Java Web Development

Course Code	101
Course Title	**Java Web Development**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to get an idea about how to use Java in Web Programming .
Course Objective	The objective of the course is to make them understand and implement the Web Oriented Project Development Model of Java.
Course Outcomes	CO1 : Students will be able to learn Object Oriented Programming concepts for problem solving using Java. CO2 : Students will be able to learn about Java design patterns. CO3 : Students will be able to learn about the java web application framework, ReactJS and REST services.
Mapping between COs with PSOs	
Pre-requisite	Understanding of OOPS concept and its implementation by Java Language
Course Outcome	Students will be able to develop Web Application in Java

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 101 : Java Web Development

Course Code	ICT 101
Course Title	Java Web Development
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to get an idea about how to use Java in Web Programming
Course Objective	The objective of the course is to make them understand and implement the Web Oriented Project Development Model of Java
Pre-requisite	Understanding of OOPS concept and its implementation by Java Language
Course Out come	Students will be able to develop Web Application in Java
Course Content	**Unit : 1 : Object Oriented Programming in Java** 1.1 Inheritance and Polymorphism 1.2 Overloading and Overriding 1.3 Abstract, Static , final classes 1.4 Interfaces 1.5 Overview of Threads 1.5.1 Creating Thread –Runnable interface 1.5.2 Multithreaded programs 1.5.3 Deadlock and Synchronization 1.6 Collections API 1.6.1 Collection 1.6.2 Java Streams 1.6.3 Set-HashSet,TreeSet 1.6.4 List-LinkedList 1.6.5 Set-HashSet,TreeSet 1.6.6 List-LinkedList 1.6.7 Map-HashMap,TreeMap 1.7 Working with Databases 1.7.1 CRUD operations 1.7.2 Working with RowSet 1.7.3 Working with detached RowSet **Unit : 2 : Java Servlets** 2.1 Java Web Architecture 2.1.1 The Java Advantage for Web 2.1.2 Java Editions, Java Enterprise Edition 2.1.3 Java EE Web Architecture 2.1.4 Java Web Application Servers 2.1.5 Installing and Configuring Payara Application Server 2.1.6 Java EE APIs for building Web Applications 2.1.7 IDEs for Enterprise Application Development 2.2 Introduction to Java Servlets 2.3 The Java Servlet API 2.5 Servlet Life Cycle

2.6 Request and Response
2.7 Dispatching and forwarding the request
2.8 Getting Values from Forms and QueryStrings
2.9 Working with HTTP Headers
2.10 Session Tracking
2.10.1 Cookies
2.10.2 Hidden Form Field
2.10.3 URL Rewriting
2.10.4 HttpSession
2.10.5 ServletConfig and ServletContext
2.10.6 Attribute in Servlet
2.10.7 Servlet Filters
2.10.8 Servlet Web Listeners
2.10.9 Working with Databases
2.10.10 Configuring Deployment Descriptor(web.xml)
2.10.11 Asynchronous Servlet
2.10.12 Server Push

Unit : 3 : Java Server Pages

3.1 Introduction to Java Server Pages(JSP)
3.2 Lifecycle of JSP
3.3 JSP Scripting Elements
3.4 Implicit Objects
3.5 JSP Directive Elements
3.6 Action Elements
3.7 Working with Java Beans
3.8 JSP Form Processing, Form Validation with Java Bean
3.9 JSP Custom Tags
3.10 State Management
3.11 Working with AJAX
3.12 Working with Web Sockets
3.13 EL - Expression Language

Unit : 4 : The Java Web Application Frameworks

4.1 Component Based Framework – JAVA SERVER FACES
4.2 Introduction to JSF
4.3 Request Processing Lifecycle
4.4 JSF Managed Beans
4.5 JSF UI Components
4.6 JSF Validators and Converters
4.7 Event Handling
4.8 Composite Components
4.9 Templating in JSF
4.10 Working with databases
4.11 Working with primefaces
4.12 Action-Based framework
4.13 Introduction to Spring

	4.14 Lifecycle of Spring MVC 4.15 DispatcherServlet 4.16 Multiple Controllers 4.17 Working with databases Spring Boot **Unit : 5 : JavaScript and ReactJS in Java Applications** 5.1 Introduction to JavaScript and jQuery 5.2 JavaScript DOM 5.3 Introduction to ReactJS 5.4 ReactJS - Environment Setup 5.4.1 JSX 5.4.2 Components 5.4.3 Component API 5.4.4 Component Life Cycle 5.4.5 State 5.4.6 Props 5.4.7 Smart DOM Updates 5.4.8 Element Tree 5.4.9 Forms 5.4.10 Events 5.4.11 Keys 5.4.12 Router 5.4.13 React UI Workflow 5.4.14 JS API for using REST Services
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 JavaServer Faces 2.2 - Anghel Leonard - Packt Publishing 5. Spring in Action 4ed - Craig Walls – Manning 6. Getting Started With Spring Framework: A Hands-on Guide to Begin Developing Applications Using Spring Framework - Ashish Sarin, J Sharma - Createspace Independent Pub 7. Spring 5 Design Patterns - Dinesh Rajput – Packt 8. Learning Spring Boot 2.0 - Greg L. Turnquist - Packt
Teaching Methodology	Black Board Teaching, power point presentation for theory, practical shown in projector for showing programs
Evaluation Method	30% Internal Exam 70% External Exam

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

Course: 102: Enterprise Java

Course Code	102
Course Title	Enterprise Java
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to understand and develop large scale enterprise , distributed and scalable applications using Java.
Course Objective	The objective of the course is to provide in depth knowledge of all JAVA API which contribute to the development of high performing , secure , distributed and scalable applications in line with the current trends in the software industry.
Course Outcomes	CO1 : Students will be able to learn about enterprise business logic, enterprise security and database persistence. CO2 : Students will be able to learn about concepts of web services, REST services and REST design patterns. CO3 : Students will be able to learn about enterprise java security with SSL certificates, securing REST services with authentication and SSL.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Java Language and Web Application concepts
Course Outcome	Students will be able to develop large scale and distributed applications in Java.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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 2019
Purpose of Course	This course helps students to understand and develop large scale enterprise , distributed and scalable applications using Java
Course Objective	The objective of the course is to provide in depth knowledge of all JAVA API which contribute to the development of high performing , secure , distributed and scalable applications in line with the current trends in the software industry
Pre-requisite	Knowledge of Java Language and Web Application concepts
Course Out come	Students will be able to develop large scale and distributed applications in Java
Course Content	**Unit : 1 : JAVA EE and EJB** 1.1 Layered model architectures – principles and goals 1.2 Java EE definition and characteristics 1.3 Java EE technologies in a multi-tier architecture 1.4 Stateless Session Bean 1.5 Stateful Session Bean 1.6 Binding and looking up objects 1.7 Singleton Beans 1.8 Local and Remote Lookups 1.9 Timers and Schedulers 1.10 Asynchronous Beans **Unit : 2 : JAVA MESSAGING SERVICES** 2.1 JMS Architecture 2.2 Queue And Topic Messages, 2.3 Message Driven Beans Life Cycle, 2.4 JMS Producers and Consumers , 2.5 Creating Client for MDB **Unit : 3 : ORM WITH JAVA PERSISTANCE** 3.1 JPA overview 3.2 JPA architecture 3.3 ORM with Entities 3.4 JPA Annotations 3.5 One to One 3.6 One to Many 3.7 Many to Many Relationships 3.8 JPA Query Language 3.9 Named Queries 3.10 Dynamic Queries AND Native Queries 3.11 Criteria Queries 3.12 Transactions 3.13 Using Hibernate as ORM

	Unit : 4 : WEB SERVICES 4.1 Introduction to web services 4.2 SOAP Envelope ,WSDL , Schema and UDDI 4.3 Creating and Publishing a SOAP based Web Service 4.4 Searching and Consuming SOAP based Web Service 4.5 Google Remote Procedure Call (GRPC) 4.6 REST services with JAX-RS API 4.7 REST Patterns 4.8 Using HTTP Methods and URL-Patterns in REST 4.9 JERSEY Client for REST Services 4.10 Using JavaScript API for calling REST methods 4.11 Micro-Services Architecture in Java 4.12 In Grid Database using Jcache / Hazelcast **Unit 5 - JAVA ENTERPRISE SECURITY** 5.1 The Need of Security and Security Threats 5.2 Realm, Users, Group and Roles 5.3 Basic Authentication 5.4 Form Based Authentication, 5.5 Protecting Your Resources with Authorization 5.6 Java API for Authentication and Security – JAAS 5.7 JAAS security for web and EJB applications 5.8 Maintaining Confidentiality and Trust with SSL certificates 5.9 JAAS Security to SOAP based Web Services 5.10 Securing REST services using Authentication Filters 5.11 Security with JWT and OAuth
Reference Book	1. Mastering Enterprise JavaBeans , Enterprise Edition, *by Ed Roman* 2. Java 8 EE Tutorial : Basic Concepts by Oracle press 3. Beginning Java™ EE 8 Platform with Payara™ Server Novice to Professional by Antonio Goncalves 4. Microservice Architecture: Aligning Principles, Practices, and Culture by Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen 2018 5. Java EE 8 Application Development by David R. Heffelfinger Packt Publication Jan 2018 6. Beginning EJB 3: Java EE 7 Edition by by Wetherbee and Chirag Rathod 7. High-Performance Java Persistence by Vlad Mihalcea 2018
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: 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 Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
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 Outcomes	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	
Pre-requisite	Basic concepts of computer network
Course Outcome	This would help students to understand vulnerability of applications and encourage them to embed security in various applications they develop.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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 2019
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
Pre-requisite	Basic concepts of computer network
Course Out come	This would help students to understand vulnerability of applications and encourage them to embed security in various applications they develop.
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 2.1.3 The Hill Cipher, Vignere Cipher 2.1.4 Rotor Machines 2.1.5 Steganography 2.1.6 Theoretical Security and Computational Security 2.1.7 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 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, Tradeoff 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. Information Security: Theory and Practice – Dhiren R. Patel – PHI
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 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 Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	To provide the student with knowledge of advanced network concepts and techniques
Course Objective	The course objective is to introduce internetworking, routing and network management concepts.
Course Outcomes	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	
Pre-requisite	Basic concepts of computer network
Course Outcome	Students will be able to understand the principles for implementing a multi layer network, management systems for the network and routing of information throughout the network.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

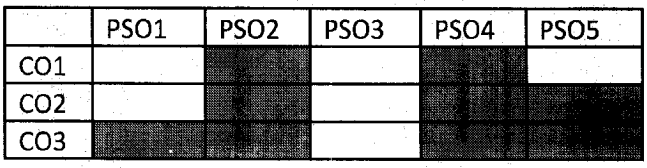
Course :104: Advanced Computer Network

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 2019
Purpose of Course	To provide the student with knowledge of advanced network concepts and techniques
Course Objective	The course objective is to introduce internetworking, routing and network management concepts.
Pre-requisite	Basic concepts of computer network
Course Out come	Students will be able to understand the principles for implementing a multi layer network, management systems for the network and routing of information throughout the 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 : IP Layer** 3.1 IP : Classful addressing 3.1.1 Two level addressing 3.1.2 Subnetting 3.1.3 Supernetting 3.2 IP : Classless addressing 3.2.1 Variable length blocks 3.2.2 Subnetting 3.3 Special Addresses 3.4 Delivery, Formatting and Routing 3.5 ARP and RARP 3.6 Internet Protocol (IP) 3.6.1 Datagram 3.6.2 Fragmentation 3.6.3 Options 3.6.4 Checksum 3.6.5 IP Package 3.7 ICMP 3.8 IGMP 3.9 Mobile IP 3.9.1 Addressing 3.9.2 Agents 3.9.3 Three Phases 3.9.4 Inefficiency in Mobile IP 3.10 Introduction to ipv6 **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.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

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

Course: 105: Practical 1

Course Code	**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 2019
Purpose of Course	The course provides practical knowledge of web application development using ReactJS and Java technologies like JSP, Servlests, JSF, etc.
Course Objective	The course prepares students to develop web applications using ReactJS and JAVA based frameworks.
Course Outcomes	CO1 : Students will be able to develop web applications using Java technologies like JSP, Servlests, JSF, etc. CO2 : Students will be able to develop web applications using Java based frameworks. CO3 : Students will be able to develop web applications using ReactJS.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts and Core Java
Course Outcome	After completion of this course, students will be able to develop web applications using ReactJS and JAVA.

Course : ICT 105 : Practical 1

Course Code	105
Course Title	Practical 1
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of web application development using ReactJS and Java technologies like JSP, Servlests, JSF, etc.
Course Objective	The course prepares students to develop web applications using ReactJS and JAVA based frameworks.
Prerequisite	Object Oriented Programming Concepts and Core Java
Course Outcome	After completion of this course, students will be able to develop web applications using ReactJS and JAVA.
Course Content	Practical based on Paper No. 101 - Java Web Development.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

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

Course: 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 2019
Purpose of Course	The course provides practical knowledge of building business logic for enterprise applications using JAVA technologies like EJB, JMS, JPA, etc.
Course Objective	The course prepares students to design enterprise application oriented components using JAVA technologies like EJB, JMS, JPA, etc.
Course Outcomes	CO1 : Students will be able to develop enterprise application using EJB, JMS, JPA, etc. CO2 : Students will be able to create web services and REST services. CO3 : Students will be able to develop enterprise application using java security with SSL certificates, securing REST services with authentication and SSL.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts and Core JAVA
Course Outcome	After completion of this course, students will be able to design and develop enterprise level components using JAVA technologies like EJB, JMS, JPA, etc.

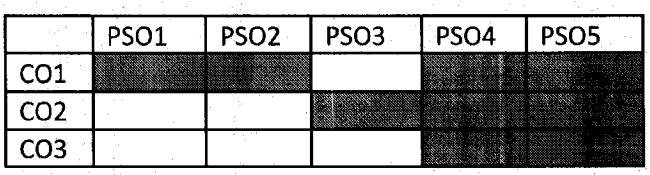
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of building business logic for enterprise applications using JAVA technologies like EJB, JMS, JPA, etc.
Course Objective	The course prepares students to design enterprise application oriented components using JAVA technologies like EJB, JMS, JPA, etc.
Prerequisite	Object Oriented Programming Concepts and Core JAVA
Course Outcome	After completion of this course, students will be able to design and develop enterprise level components using JAVA technologies like EJB, JMS, JPA, etc.
Course Content	Practical based on Paper No. 102- Enterprise Java.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

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

Course: 107: Part Time Project 1

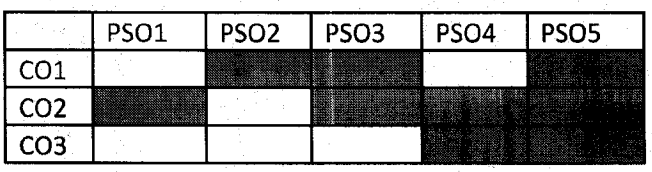
Course Code	**107**
Course Title	**Part Time Project 1**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	The project work is introduced to make students implement their theory 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.
Course Outcomes	CO1 : Students will be able to develop multi layered and MVC based Java 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	
Pre-requisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.

Course : 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 2019
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.
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.
Course Content	The students are required to develop project based on Java Enterprise Edition. 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

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

Course: 201: C#.NET

Course Code	**201**
Course Title	**C#.NET**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to understand C#.NET language concepts and to use them in any real world .NET application.
Course Objective	To impart knowledge of C#.NET features and its object oriented paradigm for application development.
Course Outcomes	CO1 : Students will be able to understand the object-oriented concepts using C#.NET application. CO2 : Students will be able to develop, implement and creating Applications using C#.Net Framework and .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, .NET Framework, ADO.NET
Course Outcome	Students will be able to develop applications using C#.NET language.

Course : ICT 201 : C#.NET

Course Code	ICT 201
Course Title	C#.NET
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to understand C#.NET language concepts and to use them in any real world .NET application.
Course Objective	To impart knowledge of C#.NET features and its object oriented paradigm for application development.
Pre-requisite	Object Oriented Fundamental, .NET Framework, ADO.NET
Course Out come	Students will be able to develop applications using C#.NET language.
Course Content	**Unit : 1: Introduction of C# and .NET Framework** 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 1.1.7 Namespaces 1.2. Data Types, Predefined Types, Complex Types 1.3. Variables and Constants 1.4. Operators 1.5. Flow Control 1.6. Program Structure 1.7. Assemblies, Threads and AppDomains 1.8. App.config – Application Settings and Connection String **Unit : 2 : Object Oriented Programming in C#** 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. Collections 2.8. Indexers 2.9. Exception & Error Handling **Unit : 3 : Supporting Features for Library Design** 3.1. Delegates 3.2. Events 3.3. Generics 3.4. Reflection 3.5. Serialization 3.6. Attributes **Unit : 4 : Language Integrated Queries - LINQ** 4.1. LINQ Language Features 4.2. Object Initialization 4.3. Anonymous Types 4.4. Implicitly Typed Local Variables 4.5. Lambda Expression 4.6. Query Expression 4.7. LINQ to Objects

	4.8. LINQ to XML 4.9. LINQ to SQL 4.10. LINQ to Entities **Unit : 5 : Programming with .NET CORE** 5.1. Overview of C#.Net CORE 5.2. .NET CORE Assemblies and Libraries 5.3. Pattern Matching 5.4. Tuples and Deconstruction 5.5. Local/Nested Functions 5.6. Expression Bodied Members 5.7. Working with Delegates and Events 5.8. Async return types 5.9. NuGet Package
Reference Book	1. Professional C# 7 and .NET Core 2.0 by Christian Nagel, Wrox / Wiley, 2018 2. C# 7 and .NET Core Cookbook by Dirk Strauss, O'Reilly / Packt Publishing Limited, 2017 3. C# 7.1 and .NET Core 2.0 - Modern Cross-Platform Development - Third Edition by Mark J. Price, Packt Publishing Limited, 2017 4. Microsoft Visual C# Step By Step by John Sharp, PHI, 2016 5. C# 7 and .NET Core 2.0 High Performance: Build highly performant, multi-threaded, and concurrent applications using C# 7 and .NET Core 2.0 by Ovais Mehboob Ahmed Khan, Packt Publishing Limited, 2018 6. C# 7 and .NET Core 2.0 Blueprints by Dirk Strauss and Jas Rademeyer, Packt Publishing Ltd, 2018 7. C# 7 and .NET Core: Modern Cross-Platform Development by Mark J. Price, Packt Publishing Ltd, 2017 8. Dependency Injection in .NET Core 2.0 by Marino Posadas and Tadit Dash, Packt Publishing Ltd, 2017 9. Thinking in LINQ: Harnessing the Power of Functional Programming in .NET Applications by Sudipta Mukherjee, APress, 2014 10. LINQ Pocket Reference: Learn and Implement LINQ for .NET Applications by Joseph Albahari, Ben Albahari, O'Reilly, 2008 11. C# 7.0 in a Nutshell: The Definitive Reference by Ben Albahari, Joseph Albahari, Shroff/O'Reilly, 2017
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: 202: Advanced.NET

Course Code	**202**
Course Title	**Advanced.NET**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	This course helps students to understand and use .NET advanced concepts with real world .NET applications.
Course Objective	To impart knowledge of Enterprise application development using .NET Framework.
Course Outcomes	CO1 : Students will be able to understand the concepts of ASP.NET advanced features. CO2 : Students will be able to learn RESTful web services and web API using .NET Framework and .NET Core. CO3 : Students will be able to learn MVC architecture and Web Application Frameworks using .NET Framework, .NET Core and Angular.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Fundamental, ADO.NET, ASP.NET
Course Outcome	Students will be able to develop enterprise applications using .NET advanced concepts.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 202 : Advanced.NET

Course Code	ICT 202
Course Title	Advanced.NET
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	This course helps students to understand and use .NET advanced concepts with real world .NET applications.
Course Objective	To impart knowledge of Enterprise application development using .NET Framework.
Pre-requisite	Object Oriented Fundamental, ADO.NET, ASP.NET
Course Out come	Students will be able to develop enterprise applications using .NET advanced concepts.
Course Content	**Unit : 1: Advanced Features of ASP.NET** 1.1. Introduction to web Architecture 1.2. Overview of ASP.NET 1.3. ASP.NET State Management 1.4. Membership Functionality 1.5. Globalization and Localization 1.6. AJAX 1.6.1. Client Side and Server Side AJAX 1.6.2. AJAX Toolkit 1.7. Hosting Web Application in IIS **Unit : 2 : ASP.NET MVC** 2.1. MVC Architectural Pattern 2.2. URL Routing Engine 2.3. Routing Configuration 2.4. Wiring Controller, Model, and View 2.5. Data Access and Modeling 2.6. TempData, ViewBag and ViewData 2.7. Unit Testing and ASP.NET MVC **Unit : 3 : RESTFul Services** 3.1. Introduction to Web Services 3.2. RESTful API 3.3. Working with .NET Application 3.4. Working with RESTful Services 3.5. Razor View Engine **Unit : 4 : ASP.NET CORE** 4.1. Introduction to ASP.NET Core 4.2. Working with OpenID and OAuth Login 4.3. Asynchronous Programming 4.4. Multiple Environments and Development Mode 4.5. Working with WebSockets and SignalR 4.6. Self hosting of Web Applications 4.7. Dependency Injection 4.8. Action Filters 4.9. Security and Identity 4.10. Working with SQL and No-SQL Data Storage Types **Unit : 5 : AngularJS with .NET** 5.1. Single-page Application Framework 5.2. Angular CLI 5.3. Model-View-Controller Architecture 5.4. Two Way Data Binding

	5.5. Directives, Pipes, Components, Scope Inheritance, Method Chaining, Templates, Services, Forms and Validation 5.6. Animation and Routing 5.7. Calling API, Using Third Party API 5.8. Web-Sockets, Use of UI Frameworks Plug-ins
Reference Book	1. Pro ASP.NET 4.5 in C# by Adam Freeman, APress, 2013 2. Mastering ASP.NET Core 2.0 by Ricardo Peres, Packt Publishing Limited, 2017 3. Professional ASP.NET MVC 5 by Jon Galloway, Wrox, 2014 4. Beginning ASP.NET 4.5: in C# and VB by Imar Spaanjaars, Wiley, 2014 5. Beginning Node.js by Basarat Syed, Apress, 2014 6. ASP.NET Core 2 Fundamentals by Onur Gumus and Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2018 7. Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2016 8. ASP.NET Core Essentials by Shahed Chowdhuri, Packt Publishing Ltd, 2016 9. Enterprise Application Architecture with .NET Core by Ganesan Senthilvel, Ovais Mehboob Ahmed Khan, Habib Ahmed Qureshi, Packt Publishing Ltd, 2017 10. ASP.NET Core 2 and Angular 5 by Valerio De Sanctis, Packt Publishing Ltd, 2017 11. ASP.NET MVC with Entity Framework and CSS by Lee Naylor, APress, 2016 12. Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
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: 203: Elective 1: Smart Device Computing Using iOS

Course Code	**203 Elective 1**
Course Title	**Smart Device Computing Using iOS**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
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 the key programming concepts of Swift programming and develop iOS iPhone/iPad applications. CO2 : Students will be able to learn the different design patterns and UIControls in Swift programming. CO3 : Students will be able to learn about different data persistence and data manipulation techniques in Swift programming.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Object Oriented Programming is desirable.
Course Outcome	The primary learning outcome for this course is that students will be able to design and create iOS apps. Students will leverage Swift, the iOS SDK, and Apple developer tools. With iOS as the platform, students will learn Object-oriented programming, Design Patterns, Type Systems, Functional Language features, user interface design, best practices in programming, and problem analysis.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

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

Course Code	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 2019
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.
Pre-requisite	Knowledge of Object Oriented Programming is desirable.
Course Out come	The primary learning outcome for this course is that students will be able to design and create iOS apps. Students will leverage Swift, the iOS SDK, and Apple developer tools. With iOS as the platform, students will learn Object-oriented programming, Design Patterns, Type Systems, Functional Language features, user interface design, best practices in programming, and problem analysis.
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 1.4.1. Implicit Optionals 1.4.2. Explicit Optionals 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 1.8. Properties and it's Attributes 1.9. Initializers in swift 1.9.1. Id 1.9.2. Self 1.9.3. Super 1.10. Enum and Struct 1.11. Protocols and Extensions 1.12. 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 Working with Basic UIElements 2.5.1 UILabel, UIButton, UITextFeild, UIImageView etc. 2.6 IBActions and IBOutlets 2.7 Auto Layout Constraints to create Adaptive UI

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

Course: 203: Elective 2: Smart Device Computing Using Android

Course Code	**203 Elective 2**
Course Title	**Smart Device Computing Using Android**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, practical , examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	Purpose of Course is help students to understand the components and structure of mobile application development framework of Android. The course also provides students with the skills necessary to develop an Android App from scratch to deploying it on the Google App Store.
Course Objective	Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices. Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.
Course Outcomes	CO1 : Students will be able to learn about the latest design concepts, controls and components of mobile application development in Android. CO2 : Students will be able to develop applications using the local database-SQLite and integrate webservices in Android. CO3 : Students will be able to learn about different types of services like background services, location based services and google maps.
Mapping between COs with PSOs	
Pre-requisite	Basic programming knowledge of Java and Event handling
Course Outcome	Course Out come is student will design and develop user Interfaces for the Android platform by applying Java programming concepts to Android application development and will be familiar with technology and business trends impacting mobile applications. Competent with the characterization and architecture of mobile applications

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: ICT 203 Elective 2: Smart Device Computing Using Android

Course Code	203 Elective 2
Course Title	Smart Device Computing Using Android
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, practical, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
Purpose of Course	Purpose of Course is help students to understand the components and structure of mobile application development framework of Android. The course also provides students with the skills necessary to develop an Android App from scratch to deploying it on the Google App Store.
Course Objective	Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices. Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.
Pre-requisite	Basic programming knowledge of Java and Event handling
Course Out come	Course Out come is student will design and develop user Interfaces for the Android platform by applying Java programming concepts to Android application development and will be familiar with technology and business trends impacting mobile applications. Competent with the characterization and architecture of mobile applications
Course Content	**Unit 1 : Basics of Android** 1.1. Introduction to Android OS 1.1.1. Android Framework 1.2. Introduction to Android Studio 1.2.1. Setting up development environment 1.2.2. Android Development Tools 1.2.3. Android Studio Project structure 1.2.4. Testing and Debugging 1.3. Activity and Activity Life Cycle 1.4. View and ViewGroups 1.4.1. Linearlayout, Relative Layout, Constraint Layout, Webview,Gridview, Recycler View, Adapter View 1.5. Intent and Intent filter 1.6. Android UI Widgets 1.7. Menus in Android 1.7.1. OptionsMenu 1.7.2. PopupMenu 1.7.3. ContextMenu 1.8. Dialogs and Notifications 1.9. Fragment 1.9.1. Fragment Life Cycle 1.9.2. Creating Fragment 1.9.3. Communicate with other fragments 1.10. Styles and Themes 1.11. App Manifest File 1.12. App Permissions 1.13. App Bar 1.13.1. Setup the App bar 1.13.2. Add and handle actions **Unit 2 : Data Storage and Retrival** 2.1. Working with files 2.1.1 Internal Storage 2.1.2 External Storage 2.2 Working with network(P2P connection) 2.3 Managing Data using SQLite 2.4 Database Debugging 2.5 Shared Preferences

	2.6 Content Provider 2.6.1 ContentResolver 2.6.2 Working with Content Provider(Contacts,SMS,Call,MMS) 2.6.3 Creating Content Provider 2.7 Data Backup **Unit 3 : Services in Android** 3.1 Overview of Services 3.2 Service types 3.2.1 Bounded 3.2.2 Started 3.3 Asynchronous Task 3.4 Broadcast Receivers 3.4.1 Listening for specified broadcasts 3.4.2 System broadcasts 3.4.3 Custom & User defined broadcasts 3.4.4 Sticky Broadcasts 3.5 Google play services 3.6 Google Map and Events with Google Map 3.7 Geo coding and Reverse geo coding **Unit 4 : Working with Audio, Video and Camera** 4.1 Camera 4.1.1 Taking Photos 4.1.2 Recording Videos 4.1.3 Controlling the camera 4.2 Images & Graphics 4.2.1 Drawables 4.3 Audio and Video 4.3.1 MediaPlayer 4.3.2 MediaController 4.4 Animations **Unit 5 : Advance Programming in Adroid** 5.1 Android Web Services 5.1.1. Check HttpURL Connection. 5.1.2. Web Service Call 5.1.3. SQLITE and MySql in web Service 5.2 XML and JSON Parsing 5.3 Push Notifications 5.4 Working with Bluetooth, Wi-Fi and Sensors 5.5 Kotlin language in Android 5.6 Gradle plugin integration 5.7 Social Login with Google, Facebook or Twitter 5.8 Network Connectivity 5.9 Publishing App
Reference Book	1. Professional Android 4 by Reto Meier WROX Publication 2. Hello, Android: Introducing Google's Mobile Development Platform by Ed Burnrtte SPD publication 3. Android Essentials by Chris Haseman Apress Publication 4. Android Development by Mark L Murphy Wiley India 5. Sams Teach Yourself Android by Lauren Darcey &Sams Publishing 6. Android Application Development Black Book by Pradeep Kothari Dreamtech publication 7. Android Programming : Pushing the Limits by Erik Hellman Wiley India 8. Android Sensor Programming by Greg Milette Wiley India
Teaching Methodology	Class Room Teaching, Discussion 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 2019
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 : ICT 204 : Digital Communication

Course Code	ICT 204
Course Title	Digital Communication
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2019
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.
Pre-requisite	Fundamental knowledge of network communication
Course Out come	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.
Course Content	**Unit : 1 : Introduction of communication system** 1.1 Introduction of Electronic communication System 1.2 Wave 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 2.4 Circuit 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. Introduction to Wireless and Mobile System, Darma Prakash agrawal, Qing-An Zeng, Cengage Publication 2. Mobile Computing, Asokek Talukder, Hasan Ahmed, Roopa Yavagal, MC Graw Hill Publication 3. Embedded systems- concepts, Design and Programming, Parag Dave, Himanshu B. Dave, Pearson Publication 4. Wireless And Mobile Communication, T.G.Palanivelu, PHI publication 5. Mobile and Personal communication systems and services, Raj pandya, PHI 6. Principles of Wireless Networks,Kavesh Pahlavan,Prashant Krishnamurti, Pearson Edition 7. Wireless and Mobile Network Architectures,Yi-Bing Lin & Imrich Chlamtac,John Wiely &sons, 8. Guide to Designing and Implementing Wireless LANs; Mark Ciampa,Thomson Learning Vikas Publishing house 9. The Wireless Application Protocol Sandip singhal, Pearson edition 10. Embedded real time system K.V.K.K. Prasad Dreamtech press 11. Adhoc Wireless Networks C.Siva Ram Murthy, B.S.Manoj Pearson Education 12. 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.) 2nd Semester

Course: 205: Practical 3

Course Code	**205**
Course Title	**Practical 3**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	The course provides practical knowledge of C#, LINQ, .NET Core, MVC and AngularJS.
Course Objective	The course prepares students to develop AngularJS and .NET based web applications.
Course Outcomes	CO1 : Students will be able to develop C#.NET framework and C#.NET core based practicals. CO2 : Students will be able to do practicals using MVC5 and MVC.NET core. CO3 : Students will be able to do practical using RESTful web API and angular.
Mapping between COs with PSOs	
Pre-requisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop AngularJS and .NET based web applications.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 205 : Practical 3

Course Code	205
Course Title	Practical 3
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
Purpose of Course	The course provides practical knowledge of C#, LINQ, .NET Core, MVC and AngularJS.
Course Objective	The course prepares students to develop AngularJS and .NET based web applications.
Prerequisite	Object Oriented Programming Concepts
Course Outcome	After completion of this course, students will be able to develop AngularJS and .NET based web applications.
Course Content	Practical based on Paper No. 201 - C#.NET and Paper No. 202-Advanced.NET.
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

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 2019
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 webservices 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 Programming Concepts
Course Outcome	After completion of this course, students will be able to develop applications for smart devices using iOS or Android.

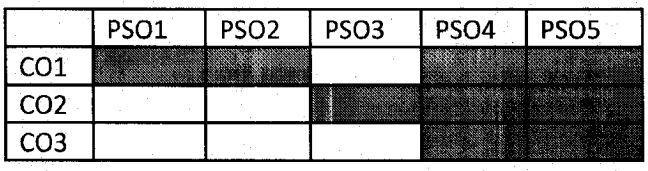
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 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.)
Review/Revision	June 2019
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.
Prerequisite	Basic Programming Concepts
Course Outcome	After completion of this course, students will be able to develop applications for smart devices using iOS or Android.
Course Content	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
Evaluation Method	30% Internal Assessment 70% External Assessment

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

Course: 207: Part Time Project 2

Course Code	**207**
Course Title	**Part Time Project 2**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2019
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 .NET and popular JavaScript based frameworks.
Course Outcomes	CO1 : Students will be able to develop project in .NET 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.
Mapping between COs with PSOs	
Pre-requisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.

Course : 207 : Part Time Project 2

Course Code	207
Course Title	Part Time Project 2
Credit	3
Teaching Per Week	3 Hrs
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2019
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 .NET and popular JavaScript based frameworks.
Prerequisite	Knowledge of Object Oriented Programming, Web Technology Fundamentals, Software Engineering.
Course Outcome	After completion of this course, students will be able to develop software applications.
Course Content	The students are required to develop project using .NET 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)
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

Re-Accredited by NAAC with 'A' Grade
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.
Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Fax : +91 - 261 - 2227312
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

ક્રમાંક : એકે./પરિપત્ર/૫૮૩૯/૨૦૨૦
તા.૧૬/૦૭/૨૦૨૦

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

વિષય :– એમ.એસસી. (આઈ.સી.ટી.) સેમેસ્ટર – ૩ અને ૪ ના અભ્યાસક્રમ બાબત.

સુજ્ઞશ્રી,

સવિનય જણાવવાનું કે,શૈક્ષણિક વર્ષ ૨૦૨૦–૨૧ થી અમલમાં આવછનાર એમ.એસસી. (આઈ.સી.ટી.) સેમેસ્ટર – ૩ અને ૪ ના પ્રવર્તમાન રીવાઈઝડ અભ્યાસક્રમ અંગે ઈન્ફોરમેશન ટેકનોલોજીની વિષયની એડહોક (નિયૂકત) સમિતિની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંકઃ ૩ અન્વયે નીચે મુજબ કરેલ ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલે તેની તા. ૩૦/૦૬/૨૦૨૦ ની સભાના ઠરાવ ક્રમાંક : ૯૯ અન્વયે મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

ઈન્ફોરમેશન ટેકનોલોજીની વિષયની એડહોક (નિયૂકત) સમિતિની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંકઃ ૩

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૦–૨૧ થી એમ.એસસી. (આઈ.સી.ટી.) સેમે.– ૩ અને ૪ ના અભ્યાસક્રમને રીવાઈઝડ કરવા નીમેલ પેટાસમિતિ ધ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમને ચર્ચા વિચારણા કર્યા બાદ સર્વાનુમતે મંજૂર કરી કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાને મંજૂર કરવા ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૩૦/૦૬/૨૦૨૦ ની સભાનાં ઠરાવ ક્રમાંકઃ ૯૯

:: આથી ઠરાવવામાં આવે છે કે, ઈન્ફોરમેશન ટેકનોલોજીની વિષયની એડહોક (નિયૂકત) સમિતિએ તેની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંકઃ ૩ અન્વયે ભલામણ કરેલ અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિદ્યાશાખાવતી સ્વીકારેલ એમ.એસસી. (આઈ.સી.ટી.) સેમેસ્ટર–૩ અને ૪ ના રીવાઈઝડ અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

ઈ.ચા.કુલસચિવ

બિડાણ : ઉપર મુજબ

પ્રતિ,

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

...તરફ જાણ તેમજ ઘટતી કાર્યવાહી સારૂ.

Re-Accredited by NAAC with 'A' Grade
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.
Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Fax : +91 - 261 - 2227312
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

AK/Circular/5839/2020
Date- 16-7-2020

The Head
J.P.Dawer Institute of Information Science and Technology
VNSGU
Surat

Subject: Regarding the syllabus of M.Sc. ICT Sem.3 and Sem.4

This is to notify that the syllabus of M.Sc.ICT Sem.3 and Sem.4 to be enforced from the Academic year 2020-21 has been recommended by the Adhoc(appointed) Committee of Information Science and Technology dated 23-1-2020 Resolution No.3 to the Faculty of Information Science and Technology which has been accepted and send for approval to the Academic Council. The same has been approved by Academic Council dated 30-6-2020, Resolution No.99, and the related teachers and students are informed hereby and, this shall be in effect now onwards.

The Adhoc appointed Committee of Information Technology dated 23-1-2020 , Resolution No.3

This is to notify that the syllabus of M.Sc.ICT Sem. 3 and 4 framed by the sub-committee and to be enforced from 2020-21 should be unanimously accepted after discussion and is recommended for further approval to the Academic Council.

The Resolution No.99 of the Academic Council dated 30-6-2020

This is to notify that the syllabus of M.Sc.ICT Sem. 3 and 4 Which was recommended by the Adhoc appointed Committee of Information Technology as on 23-1-20 Under resolution No.3 was accepted by the Dean of Faculty of Information Technology on behalf of the faculty is accepted and approved .

Enclosure: As Above

I/C Registrar

1.Dean, Faculty of Information Science and Technology

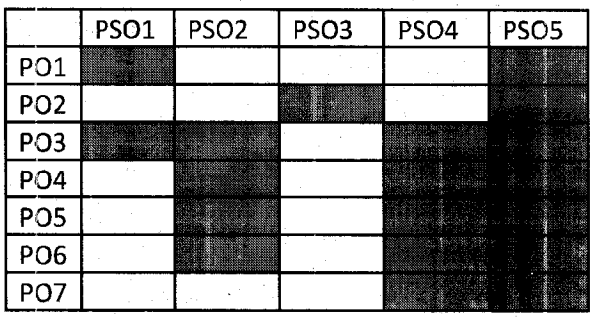
2.Exam Controller, VNSGU (Do the further needful)

Translated from Gujarati to English

I/C Registrar
Veer Narmad South Gujarat University
SURAT.

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 resource 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 project provides 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. 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	

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 301	Introduction to Python and Data Science	4	0	4	3 Hrs	70	30	100
ICT 302	Data Communication and Internet of Things	4	0	4	3 Hrs	70	30	100
ICT 303	Cloud Computing	4	0	4	3 Hrs	70	30	100
ICT 304	Open Source Web Development	4	0	4	3 Hrs	70	30	100
ICT 305	Practical 5	-	3	3	2 Hrs	70	30	100
ICT 306	Practical 6	-	3	3	2 Hrs	70	30	100
ICT 307	Part Time Project 3	-	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 401	Project	-	-	25	-	490	210	700
	Total	-	-	25	-	490	210	700

Master of Science (Information & Communication Technology)

Name of Program	Master of Science (Information and Communication Technology)
Abbreviation	M.Sc. (I.C.T.)
Duration	2 years
Eligibility	Graduate in the discipline of computer application / computer science / computer engineering / Information Science / Information Technology
Objective of Program	To prepare human resource for cutting edge technologies in the field of ICT.
Program Outcome	After the completion of the course, students will be able to develop and manage various types of projects in the field of ICT.
Effective From	June 2020

Program Structure		**M.Sc. (I.C.T.) – Semester 1 (M.Sc. (I.C.T.) 2 years PG Course)**						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
ICT 301	Introduction to Python and Data Science	4	0	4	3 Hrs	70	30	100
ICT 302	Data Communication and Internet of Things	4	0	4	3 Hrs	70	30	100
ICT 303	Cloud Computing	4	0	4	3 Hrs	70	30	100
ICT 304	Open Source Web Development	4	0	4	3 Hrs	70	30	100
ICT 305	Practical 5	-	3	3	2 Hrs	70	30	100
ICT 306	Practical 6	-	3	3	2 Hrs	70	30	100
ICT 307	Part Time Project 3	-	3	3	-	70	30	100
	Total	16	9	25	-	490	210	700

Program Structure		**M.Sc. (I.C.T.) – Semester 2 (M.Sc. (I.C.T.) 2 years PG Course)**						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
ICT 401	Project	-	-	25	-	490	210	700
	Total			25	-	490	210	700
Program Passing Rules		**As per University rules**						

M.Sc. (I.C.T.) 3rd Semester

Course: 301: Introduction to Python and Data Science

Course Code	**301**
Course Title	**Introduction to Python and Data Science**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2019
Purpose of Course	The purpose of this course is to provide introductory knowledge of Python programming and data science.
Course Objective	The objective of the course is to impart practical knowledge of Python programming and data science concepts.
Course Outcomes	CO1 : Students will be able to understand python language in detail using different python libraries. CO2 : Students will be able to perform data wrangling and statistical operations using python. CO3 : Students will be able to learn to mine data using python libraries.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming, Mathematics and Statistics.
Course Outcome	Students will be able to apply data science concepts using Python programming language.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: ICT 301: Introduction to Python and Data Science

Course Code	ICT 301
Course Title	Introduction to Python and Data Science
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	The purpose of this course is to provide introductory knowledge of Python programming and data science.
Course Objective	The objective of the course is to impart practical knowledge of Python programming and data science concepts.
Pre-requisite	Basic concepts of Programming, Mathematics and Statistics.
Course Out come	Students will be able to apply data science concepts using Python programming language.
Course Content	**Unit : 1 : Introduction to Data science** 1.1 Brief history 1.2 Data Science Life cycle 1.3 Application of data science 1.3.1 Natural Language Processing 1.3.2 Computer Vision 1.3.3 Big Data 1.4 Issues in data science **Unit : 2 : Core statistics for data science** 2.1 Vectors 2.2 Matrices 2.3 Descriptive Statistics 2.3.1 Mean 2.3.2 Median 2.3.3 Mode 2.3.4 Standard Deviation 2.3.5 Variance and Covariance 2.4 Measures of Central Tendency and Variance 2.5 Normal, Binomial and Poisson Distributions 2.6 Correlations 2.7 Normal and Continues Probability 2.8 Stochastic Gradient Decent 2.9 Confidence Interval 2.10 Root Mean Square Error(RMSE) **Unit : 3 : Basics of Python** 3.1 Working with script files in Python 3.2 Data structures and Data types in Python 3.3 Working with Programming Constructs in Python 3.4 Strings 3.5 Exception 3.6 Lists 3.7 Tuples 3.8 Dictionaries Sets 3.9 Sorting 3.10 Object Oriented Programming **Unit : 4 : Working with Python Libraries for Data Science** 4.1 NumPy 4.1.1. Arrays and its operations 4.1.2. Indexing and Slicing 4.1.3. Array Shape manipulation and sorting 4.2 Pandas 4.2.1. Working with Data frames 4.2.2. Indexing of data frames 4.2.3. Grouping and Merging of data frames

	4.3 Introduction to Scipy and iPython 4.5 Data Visualization with Matplotlib 4.5.1. Bar Chart 4.5.2. Line Chart 4.5.3. Scatter Plot **Unit : 5 : Working with Models** 5.1 Descriptive and Predictive Modeling 5.2 Supervised Vs Unsupervised Learning 5.3 Types of data : training, test, validation 5.4 Dataset Preparation 5.5 Model Preparation 5.6 Dimension Reduction : Principal Component Analysis (PCA) 5.7 Classification 5.8 Regression 5.9 Cross-Validation
Reference Book	1. Python Data Science Handbook: Essential Tools for Working with Data, Jake VanderPlas, 1 January 2016,O'Relly Media,ISBN : 978-1491912058 2. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools , Davy Cielen et.al. , 1 January 2016,dreamtech,ISBN: 978-1633430037 3. Data Science From Scratch: First Principles with Python, Second Edition, Joel Grus, 5 May 2019,O'Relly Media,ISBN: 9781492041139 4. Python for Data Science For Dummies, 2ed,, Luca Massaron John Paul Mueller, Paperback – 2019, Wiley; January 2019, ISBN: 9781119547648 5. Data Science with Python, Rohan Chopra, Aaron England, Et al, July 19, 2019,Packt , ISBN: 9781838552862 6. Python Data Science Essentials - Third Edition, Alberto Boschetti, Luca Massaron, September 27, 2018,Packt , ISBN: 9781789537864 7. Statistics for Data Science, James D. Miller, November 17, 2017 ,Packt, ISBN: 9781788290678
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 302: Data Communication and Internet of Things

Course Code	**302**
Course Title	**Data Communication and Internet of Things**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to provide understanding of data communication and IoT.
Course Objective	The objective of this course is to provide knowledge of data communication, understanding of IoT application, IoT development process, IoT reference architecture, security issues of IoT and embedded system role in IoT.
Course Outcomes	CO1 : Students will be able to analyze and understand the vision of IoT. CO2 : Students will be able to learn about embedded devices for IOT, data organizing and data processing in IOT. CO3 : Students will be able to learn about business models in IOT and security requirements.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Pre-requisite	Computer Network
Course Outcome	Students will get knowledge of Data communication and IoT concepts.

Course : ICT 302 : Data Communication and Internet of Things

Course Code	ICT 302
Course Title	Data Communication and Internet of Things
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	The purpose of this course is to provide understanding ofdata communication and IoT.
Course Objective	The objective of this course is to provide knowledge of data communication, understanding of IoT application, IoT development process, IoT reference architecture, security issues of IoT and embedded system role in IoT.
Pre-requisite	Computer Network
Course Out come	Students will get knowledge of Data communication and IoT concepts
Course Content	**Unit : 1:Introduction of IoT** 1.1 Introduction of IoT. 1.2 Introduction of IoT architecture. 1.3 IOT conceptual framework. 1.4 Technology behind IoT. 1.5 Sources of IoT. **Unit : 2: Prototyping the Embedded Devices for IoT and M2M Data Communication** 2.1 Introduction of sensor technology. 2.2 Embedded Computing Basics 2.3 Embedded Platforms for Prototyping 2.4 Wired and wireless communication technologies for M2M communication. 2.5 Things always connected to the internet. **Unit : 3:Fundamental ofData Acquisition, Data Organizing and Data Processing inIoT** 3.1 Data Acquiring and Storage 3.2 Organizing Data and Data Analytics 3.3 Transactions, Business Processes, Integration and Enterprise System. 3.4 Knowledge acquiring, managing and Storing Processes. **Unit : 4: IoT Privacy, Security and Vulnerabilities Solutions** 4.1 Introduction 4.2 Vulnerabilities, security requirements and Threat Analysis 4.3 IoT security Tomography and Layered Attacker Models 4.4 Identity Management and Establishment, access Control and Secure Message Communication 4.5 Introduction of Security Models, Profiles and Protocols for IoT. **Unit : 5: Business Models and Process using IoT** 5.1 Business models and innovations 5.2 Value creation through IoT 5.3 Business Model scenario for IoT 5.4 IoT case studies.
Reference Book	1. Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017 2. Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015 3. Internet of Things: Technologies and Applications for a New Age of Intelligence,Vlasios Tsiatsis, Stamatis Karnouskos and Jan Holler, Academic Press,2018 4. Raspberry Pi Cookbook,Simon Monk,, O'Reilly Publishing Limited, 2014

	5. The Internet of Things, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley,2018 6. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley,2018 7. The Internet of Things, Hakima Chaouchi, Wiley,2017
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 303: Cloud Computing

Course Code	**303**
Course Title	**Cloud Computing**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	This course helps students to understand concepts of Cloud Computing and Micro Service Architecture implementations.
Course Objective	To impart knowledge of Cloud Computing concepts and cloud services for application development, deployment and management on cloud.
Course Outcomes	CO1 : Students will be able to learn about cloud infrastructure and architectures. CO2 : Students will be able to learn concepts of cloud computing and basic services of AWS, Azure and GCP CO3 : Students will be able to learn about microservices architecture and devOps toolchain.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming, Operating System and Networking
Course Outcome	Students will get knowledge of Cloud Computing concepts along with development, deployment and management of application(s) using Micro Service Architecture.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 303 : Cloud Computing

Course Code	ICT 303
Course Title	Cloud Computing
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 understand concepts of Cloud Computing and Micro Service Architecture implementations.
Course Objective	To impart knowledge of Cloud Computing concepts and cloud services for application development, deployment and management on cloud.
Pre-requisite	Basic concepts of Programming, Operating System and Networking
Course Out come	Students will get knowledge of Cloud Computing concepts along with development, deployment and management of application(s) using Micro Service Architecture.
Course Content	**Unit : 1: Introduction to Cloud Computing** 1.1 Characteristics of Cloud Computing 1.2 Cloud Service Models - Infrastructure as a Service, Platform as a Service, Software as a Service and Anything as a Service 1.3 Cloud Deployment Models - Private Cloud, Community Cloud, Public Cloud andHybrid Cloud 1.4 Difference Between Traditional Commuting and Cloud Computing 1.5 Virtualization 1.5.1 Need of Virtualization 1.5.2 Types of Virtualization 1.5.3 Virtualization in Cloud Computing 1.6 Containerization 1.6.1 Concept of Containerization 1.6.2 Need of Containerization 1.6.3 Containerization and Virtualization **Unit : 2: Cloud Infrastructure and Architectures** 2.1 Cloud Computing Stack 2.1.1 Composability 2.1.2 Infrastructure 2.1.3 Platforms 2.1.4 Virtual Applications 2.1.5 Communication Protocols 2.1.6 Applications 2.2 Cloud Data Center Architecture 2.3 Conceptual View of Networking in Cloud Computing 2.4 Cloud Data Storage (Overview of SAN, DFS, etc.) 2.5 Computing Cluster in Cloud 2.6 Service Level Agreement and Cloud Pricing Model 2.7 Cloud Security Concepts 2.8 QoS Measurement in Cloud 2.9 Inter Cloud Communication **Unit : 3: Service Offerings by Cloud Providers** 3.1 Introduction to Amazon Cloud Services 3.1.1 EC2 – Elastic Cloud Compute 3.1.2 Elastic Container Service 3.1.3 Elastic Kubernetes Service 3.1.4 Lambda – Serverless Computing 3.1.5 VPC – Virtual Private Cloud 3.1.6 S3 – Simple Storage Service 3.1.7 EBS – Elastic Block Storage 3.1.8 RDS – Relational Database Service 3.1.9 DynamoDB 3.1.10 Cloud9

	3.2 Introduction to Microsoft Azure 3.2.1 Service Fabric 3.2.2 AKS – Azure Kubernetes Service 3.2.3 Container Instances 3.2.4 Azure SQL 3.2.5 Azure DevOps 3.2.6 Security Center 3.2.7 Azure IoT Hub 3.2.8 Traffic Manager 3.2.9 Cognitive Services 3.3 Introduction to Google Cloud Services 3.3.1 Google App Engine 3.3.2 Google Compute Engine 3.3.3 Google Kubernetes Engine 3.3.4 Cloud Functions 3.3.5 Cloud SQL 3.3.6 Cloud BigTable 3.3.7 Cloud Code 3.3.8 Virtual Private Cloud 3.3.9 Knative 3.3.10 Persistent Disk **Unit : 4: Micro Services Architecture (MSA)** 4.1 An Overview of Current Architectural Patterns 4.1.1 Monolithic architecture 4.1.2 Enterprise Architecture 4.1.3 Service Oriented Architecture 4.1.4 Micro Services Architecture 4.2 Microservice Architecture 4.2.1 Decomposition 4.2.2 Decompose by Business Capability 4.2.3 Decompose by Subdomain 4.2.4 Self-Contained Service 4.2.5 Service per Team 4.3 Data Management 4.3.1 Database per Service 4.3.2 Saga Design Pattern for Database Transactions in MSA 4.3.3 API Composition 4.3.4 Command Query Responsibility Segregation (CQRS) 4.3.5 Domain Event 4.3.6 Event Sourcing 4.4 Transactional Messaging 4.4.1 Transactional Outbox 4.4.2 Transaction Log Tailing 4.5 Health Check API 4.6 Log Deployments and Changes **Unit : 5: Realizing Micro Services with DevOps** 5.1 Ecology for MSA 5.2 Micro Servers 5.3 Rest API 5.4 Packaging Micro Services Applications 5.5 Containerization with Docker 5.6 Docker Client Commands 5.7 Cluster Management with Hazelcast 5.8 Data Caching for Micro Services 5.9 Container Orchestration and Load Balancing 5.10 Security Propagation across Micro Services 5.11 Micro Profile based Application for MSA 5.12 Service Discovery API 5.13 Deploying MSA based Applications on cloud.

Reference Book	1. Cloud Computing and Virtualization by Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee, WILEY, 2018 2. Cloud Computing : A Practical Approach by Anthony Velte, Toby Velte, Robert Elsenpeter, Mc Graw Hill, 2017 3. Cloud Computing – Black Book by Kailash Jayaswal, Jagannath kallakurchi, Donald Houde, Deven Shah, Dreamtech Press, 2014 4. Architecting The Cloud by Michael Kavis, WILEY, 2014 5. Learning AWS by Aurobindo Sarkar, Amit Shah, Packt Publication, 2015 6. Google Cloud Platform Cookbook by LegorieRajan, Packt Publication, 2018 7. Building Your Next Big Thing with Google Cloud Platform by S.P.T. Krishnan, Jose L. Ugia Gonzalez, Apress, 2015 8. Microsoft Azure Fundamentals by Jim Cheshire, Pearson, 2019 9. Microservice Architecture: Aligning Principles, Practices, and Culture by Mike Amundsen, Ronnie Mitra, SPD publications, 2016 10. Building Microservices Paperbackby Sam Newman, SPD Press, 2017 11. Microservices for Java EE Architects: Addendum for The Java EE Architect's Handbook by Derek C. Ashmore, 2017 12. Kubernetes Microservices with Docker by Deepak Vohra,Apress Publication, 2018 13. Docker Quick Start Guide: Learn Docker like a boss, and finally own your applications by Earl Waud, PACKT publications, 2018 14. Apache ZooKeeper Essentials by Saurav Haloi, PACKT publications, 2015 15. Hazelcast A Complete Guide - 2019 Edition by Gerardus Blokdyk publication: 5STARCooks, 2019 16. Microservices Patterns: With examples in Java by Chris Richardson, Publisher: Manning Publications, 2018 17. Microservices and Containers 1st Edition by Parminder Singh, Kocher Publisher - Addison-Wesley Professional, 2018 18. Hands-On Microservices with Kubernetes: Build, deploy, and manage scalable microservices on Kubernetes, by Gigi Sayfan,Packt Publications
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 304: Open Source Web Development

Course Code	**304**
Course Title	**Open Source Web Development**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of the course is to provide knowledge of web application development using open source web technologies.
Course Objective	The objective of the course is to impart knowledge of web application development using PHP and Nodejs.
Course Outcomes	CO1 : Students will be able to learn web development using PHP. CO2 : Students will be able to learn web development in NodeJS and express. CO3 : Students will be able to develop backend applications using PHP & NodeJS and implement version control using Git.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Web development and Object-Oriented programming
Course Outcome	Students will be able to develop web application using PHP and NodeJS.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 304 : Open Source Web Development

Course Code	ICT 304
Course Title	Open Source Web Development
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	The purpose of the course is to provide knowledge of web application development using open source web technologies.
Course Objective	The objective of the course is to impart knowledge of web application development using PHP and Nodejs.
Pre-requisite	Basic concepts of Web development and Object-Orientedprogramming
Course Out come	Students will be able to develop web application using PHP and NodeJS.
Course Content	**Unit : 1 :Open Source Web Technology and PHP Language Basics** 1.1 Client server architecture, Web servers , Apache , Nginix 1.2 Understanding of frontend and backend technologies 1.3 PHP Language Characteristics, Features and Extensions 1.4 Dependencies, Use of Composer 1.5 Language Constructs, Variables, Declarations and Types, Constants 1.6 Use of Operators and Control Structures 1.7 Arrays, Functions and References 1.8 PHP Configuration Directives of php.ini file 1.9 Super Global Arrays 1.10 Handling Session, Cookies, Form Data, File Uploads, Server Data, Server Environment 1.11 OOP Features of PHP, Use Of Constructors, Destructors, Inheritance Serialization 1.12 Built-In Libraries: String, Array, Mathematics, Graphics Library, File System, Date and Time, Files and Directory, XML, PDF, HTTP, Network, PHP Options and Information, ZIP File 1.13 Security, Encryption, Securing Request Data, Filtering, Using CAPTCHA **Unit : 2 : Database Integration in PHP** 2.1 Configuring and Starting MySQL Server, Database, Tables 2.2 Working with PhpMyAdmin 2.3 MysqlConnection libraries,MySQLi, PDO, Error Handling, SQL Injection Attack and Prevention 2.4 NoSQL Databases, Types of NoSQL Databases, SQL vs NoSQL 2.5 Any one NoSQL Database Integration with PHP 2.6 Develop REST API, GraphQL 2.7 Test REST API: Use Postman tool, browser tools and CURL 2.8 Call Third Party API from PHP **Unit : 3 : Introduction to PHP Frameworks** 3.1 PHP Frameworks and Libraries 3.2 Introduction to Any one MVC framework in PHP 3.3 Use of AJAX with jQuery and JSON **Unit : 4 : Node.js** 4.1 Architecture of Node.js Ecosystem 4.2 Familiarity with JavaScript 4.3 Events, Callbacks, Asynchronous execution, I/O 4.4 Prototypal inheritance 4.5 Modules, npm, package.json 4.6 Basic utility packages 4.7 Express framework: Routing, Middleware, Templates, Form data, URL, Cookies, Session, Authentication 4.8 Working withDatabase Engine like Mongo and Mongoose 4.9 RESTful API

	Unit : 5 : Developer Tools 5.1 Browser Tools 5.2 Version control using Git and others
Reference Book	1. Programming PHP - Rasmus Lerdorf, Kevin Tatroe - O'Reilly 2. PHP 7 Programming Cookbook - Doug Bierer- O'Reilly - PACKT 3. Mastering PHP 7 by BrankoAjzele - O'Reilly 4. NoSQL For Dummies 1st Edition by Adam Fowler Publisher: For Dummies 5. Beginning PHP: Master the latest features of PHP 7 and fully embrace modern PHP development – 31 Jul 2018 - David Carr - PACKT 6. Learning PHP 7 High Performance - 6 Jan 2016 by Altaf Hussain - PACKT 7. Mastering Laravel - Pecoraro Christopher John - PACKT 8. Node.js for PHP developers - Daniel Howard - First edition - O'Reily 9. Mastering Node.js - Second Edition: Build robust and scalable real-time server-side web application -- Sandro Pasquali - PACKT
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 305: Practical 5

Course Code	**ICT 305**
Course Title	**Practical 5**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to provide introductory practical knowledge of Python programming, data science and application development using Micro Services Architecture.
Course Objective	The objective of the course is to impart practical knowledge of Python programming, data science concepts and application development using Micro Services Architecture.
Course Outcomes	CO1 : Students will be able to develop the application using the python programming. CO2 : Students will be able to develop data analysis models using the data science concepts. CO3 : Students will be able to develop the application using Micro Service Architecture.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Programming, Mathematics and Statistics.
Course Outcome	Students will be able to apply data science concepts using Python programming language and will be able to develop applications using Micro Services Architecture.

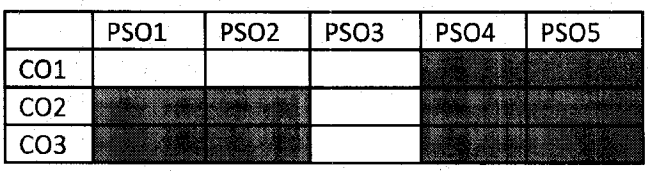
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course:ICT 305: Practical5

Course Code	ICT 305
Course Title	Practical 5
Credit	3
Teaching Per Week	3Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of this course is to provide introductory practical knowledge of Python programming, data scienceand application development using Micro Services Architecture.
Course Objective	The objective of the course is to impart practical knowledge of Python programming, data science conceptsand application development using Micro Services Architecture.
Prerequisite	Basic concepts of Programming, Mathematics and Statistics.
Course Outcome	Students will be able to apply data science concepts using Python programming language and will be able to develop applications using Micro Services Architecture.
Course Content	Practical based on Paper No. ICT 301 – Introduction to Python and Data Science and ICT 303 – Cloud Computing (Unit 4 : Micro Services Architecture)
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 306: Practical 6

Course Code	**ICT 306**
Course Title	**Practical 6**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of the course is to provide practical knowledge of web application development using open source web technologies.
Course Objective	The objective of the course is to impart practical knowledge of web application development using PHP and NodeJS.
Course Outcomes	CO1 : Students will be able to develop web applications in PHP. CO2 : Students will be able to develop web applications in NodeJS and express. CO3 : Students will be able to develop backend applications using PHP & NodeJS and version control using git practically.
Mapping between COs with PSOs	
Pre-requisite	Basic concepts of Object-Oriented programming
Course Outcome	Students will be able to develop web application using PHP and NodeJS.

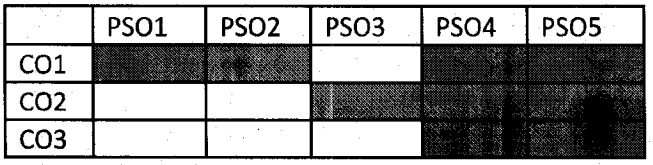
	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course: ICT 306: Practical6

Course Code	ICT 306
Course Title	Practical6
Credit	3
Teaching Per Week	3 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of the course is to provide practical knowledge of web application development using open source web technologies.
Course Objective	The objective of the course is to impart practical knowledge of web application development using PHP and NodeJS.
Prerequisite	Basic concepts of Object-Oriented programming
Course Outcome	Students will be able to develop web application using PHP and NodeJS.
Course Content	Practical based on Paper No. ICT 304-Open Source Web Development
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.C.T.) 3rd Semester

Course: 307: Part Time Project 3

Course Code	**ICT 307**
Course Title	**Part Time Project 3**
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	The purpose of this course is to develop skills to solve real world problems using Mobile / MEAN stack / IoT / PHP / Data Science / Cloud technologies.
Course Objective	The objective of this course is to acquaint students for the development of software application based on Mobile / MEAN stack / IoT / PHP / Data Science / Cloud.
Course Outcomes	CO1 : Students will be able to develop project in Mobile / Full stack / IOT / PHP / Data science / Cloud 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.
Mapping between COs with PSOs	
Pre-requisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be able to develop and demonstrate software applications based on Mobile / MEAN stack / IoT / PHP / Data Science / Cloud technologies.

Course : ICT 307 : Part Time Project 3

Course Code	ICT 307
Course Title	Part Time Project3
Credit	3
Teaching Per Week	3 Hrs
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	The purpose of this course is to develop skills to solve real world problems using Mobile / MEAN stack / IoT / PHP / Data Science / Cloud technologies.
Course Objective	The objective of this course is to acquaint students for the development of software application based on Mobile / MEAN stack / IoT / PHP / Data Science / Cloud.
Prerequisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be able to develop and demonstrate software applications based on Mobile / MEAN stack / IoT / PHP / Data Science / Cloudtechnologies.
Course Content	The students are required to develop project usingMobile / MEAN stack / IoT / PHP/ Data Science / Cloud technologies. 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 atthe 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) Note : If student's performance is not satisfactory then as per the direction of the internal project guide / external examiner student may have to do coding in the lab according to the project work submitted during internal submission / external examination.
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

M.Sc. (I.C.T.) 4th Semester

Course: 401: Project

Course Code	**ICT 401**
Course Title	**Project**
Credit	25
Teaching per Week	-
Duration	-
Minimum weeks per Semester	15 (Including Practical Work, examination, preparation, holidays etc.)
Effective From	June 2020
Purpose of Course	To acquaint students with technological practices followed in the IT industry by making them work on project for 6 months.
Course Objective	To familiarize students with IT projects development and management practices in industry.
Course Outcomes	CO1 : Students will be able to apply digital communication technologies and develop software applications in industry. 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 databases for projects.
Mapping between COs with PSOs	
Pre-requisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be ready to work as an ICT professional.

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					

Course : ICT 401 : Project

Course Code	ICT 401
Course Title	Project
Credit	25
Teaching Per Week	-
Duration	-
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2020
Purpose of Course	To acquaint students with technological practices followed in the IT industry by making them work on project for 6 months.
Course Objective	To familiarize students with IT projects development and management practices in industry.
Prerequisite	Fundamental of software application development
Course Outcome	After completion of this course, students will be ready to work as an ICT professional.
Course Content	The students are required to do 6 months full time project preferably in industry. 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 atthe 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) Note : If student's performance is not satisfactory then as per the direction of the internal project guide / external examiner student may have to do coding in the lab according to the project work submitted during internal submission / external examination.
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment