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VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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ક્રમાંક : એકે./પરિપત્ર/૧૦૦૩૮/૧૯
તા.૧૭/૦૬/૨૦૧૯

પ્રતિ,
વડાશ્રી,
કોમ્પ્યુટર સાયન્સ ડિપાર્ટમેન્ટ,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષય :– એમ.સી.એ. સેમેસ્ટર–૩ અને ૪ ના અભ્યાસક્રમ બાબત.

સુજ્ઞશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર M.C.A. (Sem-3 & Sem 4) ,ના અભ્યાસક્રમ અંગે કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિની તા.૧૨/૦૩/૨૦૧૯ની સભાનાં ઠરાવ ક્રમાંકઃ ૪ અન્વયે કરેલ નીચેની ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાએ તેની તા.૨૯/૦૪/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૬ અન્વયે સ્વીકારી મંજુર કરેલ છે અને તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલે તેની તા. ૦૭/૦૬/૨૦૧૯ ની સભાના ઠરાવ ક્રમાંક : ૩૮ અન્વયે મંજૂર કરેલ છે, તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિની તા.૧૨/૦૩/૨૦૧૯ની સભાનાં ભલામણ ક્રમાંકઃ ૪

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર M.C.A. (Sem-3 & Sem-4) નાં અભ્યાસક્રમમાં પેપર– ૪૦૪ " Python and Introduction to Machine Learning" નો ઉમેરો કરવો અને અભ્યાસક્રમ સ્વીકારી તે મંજૂર કરવા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૨૯/૦૪/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૬

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર M.C.A.(Sem-3 & Sem-4) નાં અભ્યાસક્રમમાં પેપર– ૪૦૪ " Python and Introduction to Machine Learning" નો ઉમેરો કરવો અને અભ્યાસક્રમ સ્વીકારી મંજૂર કરવા આવે છે અને તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૭/૦૬/૨૦૧૯ની સભાનાં ઠરાવ ક્રમાંકઃ ૩૮

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર M.C.A.(Sem-3 & Sem-4) નાં અભ્યાસક્રમમાં પેપર– ૪૦૪ " Python and Introduction to Machine Learning" નો ઉમેરો કરેલ અભ્યાસક્રમ સ્વીકારી મંજૂર કરવા આવે છે.

બિડાણ : ઉપર મુજબ

ઈ.ચા.કુલસચિવ

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.

Veer Narmad South Gujarat University

MCA 3rd Semester

Teaching and Evaluation Scheme

Paper	Title	Teaching		Credits	University Exam		Internal Marks	Total
		Theory (Hrs)	Practical (Hrs)		Duration	Marks		
301	Client Server Architecture	4	0	4	3 Hrs	70	30	100
302	Operating System	4	0	4	3 Hrs	70	30	100
303	Cloud Computing	4	0	4	3 Hrs	70	30	100
304	Programming in .NET	4	0	4	3 Hrs	70	30	100
305	Java Programming	4	0	4	3 Hrs	70	30	100
306	Programming Skills V	0	3	3	2 Hrs	70	30	100
307	Programming Skills VI	0	4	4	2 Hrs	70	30	100
308	Programming Skills VII	0	3	3	2 Hrs	70	30	100

Veer Narmad South Gujarat University
MCA 4th Semester
Teaching and Evaluation Scheme

Paper	Title	Teaching		Credits	University Exam		Internal Marks	Total
		Theory (Hrs)	Practical (Hrs)		Duration	Marks		
401	Android Application Prog.	4	0	4	3 Hrs	70	30	100
402	Information Systems	4	0	4	3 Hrs	70	30	100
403	Data Communication and Network Protocols (Elective)	4	0	4	3 Hrs	70	30	100
	Cyber Security & Forensics(Elective)	4	0	4	3Hrs	70	30	100
404	Interactive Computer Graphics(Elective)	4	0	4	3 Hrs	70	30	100
	Cryptography(Elective)	4	0	4	3 Hrs	70	30	100
405	Front-end Technologies	4	0	4	3 Hrs	70	30	100
406	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
407	Programming Skills IX	0	2	2	2 Hrs	70	30	100
408	Programming Skills X	0	2	2	2 Hrs	70	30	100
409	Part Time Project	0	4	4	-	70	30	100

MCA 3rd Semester

Course: 301: Client Server Architecture

Course Code	301
Course Title	**Client Server Architecture**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	Give fundamental knowledge of Database Models, Oracle Database Server Architecture and Working knowledge of SQL & PL/SQL in Oracle.
Course Objective	To acquaint the students with Client Server Architecture in general and Oracle Architecture in particular. Also, to get working knowledge of SQL and PL/SQL programming
Pre-requisite	Nil
Course Outcome	After studying the course, students will be able to understand how Oracle Database works and the importance of various components of Oracle. This course will also help students to appreciate the role of a database administrator. After successful completion, students will be able to manage Oracle database and will be able to write codes in SQL & PL/SQL necessary for an application.
Course Content	**Unit 1: Database Computing Models** 1.1 Client Server Computing: Functions of Client, Server, Middleware Components 1.2 Advantages and limitations of Client Server Computing 1.3 Three Tier Architecture: Overview of thin client, application server, web server 1.4 Overview of Distributed Database 1.5 Overview of Real Application Clusters **Unit 2: Overview of Oracle Database Server Architecture** 2.1 Architecture of Oracle Database and Oracle Instance 2.2 Overview of Physical and Logical Structures 2.3 Dedicated and Shared Server Configuration 2.4 Oracle Server Startup and Shutdown 2.5 Creating Database **Unit 3: Oracle Tools and Utilities** 3.1 SQL 3.2 Pl/SQL Procedural Extension. 3.2.1 Overview, PL/SQL data types & Control Structures 3.2.2 Cursors 3.2.3 Stored Procedures & Functions 3.2.4 Database Triggers 3.2.5 Package Creation **Unit 4: Database Administration** 4.1 Managing Users 4.1.1 User Authentication Methods 4.1.1.1 Password Authentication 4.1.1.2 O.S Authentication 4.1.2 User Configuration Setup 4.1.2.1 Profiles 4.1.2.2 Default Table space

	4.1.2.3 Temporary Table space 4.1.3 Resource Management 4.1.3.1 Quotas 4.1.4 Working with user database account 4.1.4.1 Creating, Modifying and deleting user account 4.1.4.2 Changing password 4.2 Backup & Recovery **Unit 5: Database Security** 5.1 Authentication 5.2 Privileged Accounts & Privileges 5.3 Object Security 5.4 System security 5.5 Database Roles 5.6 Database Auditing [Self-Study] Export & Import Tools, Overview of Grid Based Database **Computing, Calling External Routines from PL/SQL
Reference Books	1. Oracle 9i PL/SQL Programming -Scott Urman- Oracle Press 2. Oracle DBA Fundamentals-I - Oracle Press 3. Effective PL/SQL: - Apress 4. Expert Oracle Database Architecture 9i and 10g- Tom Kyte- Apress 5. Effective Oracle by Design - Peter Norton - Tom Kyte- Oracle Press 6. Oracle 24 X 7 Tips and Techniques - Venkat Devraj– Oracle Press 7. Expert Oracle Database 11g Administration – Alpati- Wiley Student Edition 8. Fundamentals of Database Management System- Gilleneon- Wiley Student Edition 9. SQL & PL/SQL for Oracle 11g Black Book - Deshpande- McGraw Hill 10. Beginning Oracle Database 11g Administration from novice to professional-Iggy Fernandez - Apress/Springer 11. Oracle PL/SQL-Benjamin Rosenweig & Elena Silvestrova- 4/e, Pearson 12. Database Systems Using Oracle: A simplified guide to SQL & PL/SQL- Shah Nilesh- PHI 13. Learning Oracle SQL & PL/SQL: A Simplified Guide- Chatterjee, Rajeeb C- PHI
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 302: Operating System

Course Code	302
Course Title	**Operating System**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course is an introduction to students to understand fundamentals of Operating system. The course also explains the concept of various operating systems, their use, architecture and its working.
Course Objective	1. To make students understand operating system fundamentals 2. To make students understand various parts of operating system 3. To make students understand the importance and use of operating system 4. To explain various types of operating system architecture
Pre-requisite	Nil
Course Out come	After studying the course, students will be able to understand how operating system works and the importance of various parts of operating system. This course will also help students to appreciate the role of various operating systems. After successful completion, students will be able to select particular configuration of computer and operating system necessary for the application.
Course Content	**Unit 1: Operating System Concepts** 1.1 History of Operating Systems 1.2 Operating System Structure: Layered System, Microkernel and Virtual Machine 1.3 System Calls **Unit 2: Process & Multi-processing** 2.1 Process Concept 2.2 Process State Transition Model 2.3 Process Scheduling 2.3.1 Scheduling Criteria 2.3.2 Scheduling Algorithms 2.3.3 Context Switching 2.4 Thread & Multithreading **Unit 3: Process Coordination** 3.1 Inter-process Communication 3.2 Process Synchronization 3.2.1 The Critical-Section Problem 3.2.2 Peterson's Algorithm 3.2.3 Semaphore 3.2.4 Classic Problems of Synchronization 3.3 Deadlock 3.3.1 Deadlock Characteristics 3.3.2 Deadlock Avoidance 3.3.3 Deadlock Prevention 3.3.4 Deadlock Detection & Recovery **Unit 4: Memory & File Management** 4.1 The notion of Physical and Logical Address Space 4.2 Binding and Binding Times 4.3 Contiguous Allocation & Non-Contiguous Allocation 4.3.1 Paging 4.3.2 Memory Mapping with Paging

	4.4 Structure of Page Table 4.5 Segmentation 4.6 Other Memory Management Schemes: Swapping and Overlays 4.7 Demand Paging & Demand Segmentation 4.7.1 Allocation of Frames 4.7.2 Page Replacement policies 4.7.3 Thrashing and other issues 4.8 File Concept: File Types and File Operation 4.9 Directory Structure 4.10 Directory Implementation 4.11 File-System Implementation 4.12 Allocation Methods 4.13 Free-Space Management 4.14 File-System Mounting 4.15 File Sharing and Protection 4.16 Log-Structured File-System **Unit 5: Device Management & Security** 5.1 I/O Hardware 5.2 Application l/O Interface 5.3 Kernel I/O Subsystem 5.4 Mass Storage Structure 5.4.1 Disk Structure 5.4.2 Disk scheduling 5.4.3 Disk Management 5.5 Protection 5.5.1 Goals of Protection 5.5.2 Domain of Protection 5.6 Security Problem 5.6.1 User Authentication 6.6.2 Cryptography as Security Tool 5.6.3 Program Threats 5.6.4 System and Network threats 5.6.5 Implementing Security Defences 5.7 Introduction to Network and Distributed O.S [Self Study] Introduction to FreeBSD and Windows Server 2008
Reference Books	1. Operating System Principles by Abraham Silberschatz - Peter Baer Galvin, and Greg Gagne Wiley India 2. Operating Systems: A Concept-based Approach – Dhamdhere-TMH 3. Modern Operating Systems - Andrew S. Tanenbaum- Pearson Edu./PHI 4. Operating Systems-Achyut Godbole – TMH 5. Distributed Operating Systems - Tanenbaum, Pearson 6. Unix Concepts and Application - Das-McGraw-Hill
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: Cloud Computing

Course Code	303
Course Title	**Cloud Computing**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make student capable of implementing the concepts, methods and tools of Cloud Computing
Course Objective	The objective of the course is to provide comprehensive and in-depth knowledge of Cloud Computing Concepts, technologies, architecture, applications and implementation.
Pre-requisite	Basics of DBMS, Web Development & HTML, Networking
Course Out come	To give basic knowledge of cloud computing, its architecture and its benefits and how to deploy applications on well-known cloud
Course Content	**Unit 1: Introduction to Cloud & its architecture** 1.1 Introduction & Definitions 1.2 Cloud Computing (NIST) 1.2.1 History & Evolution 1.2.2 Properties & Characteristics 1.2.3 Advantages & Disadvantages 1.3 Cloud Architecture overview **Unit 2: Cloud Computing Models** 2.1 Cloud computing Stack 2.1.1 Comparison with traditional architecture 2.2 Service Models 2.2.1 Infrastructure as a Service (IaaS) 2.2.2 Platform as a Service (PaaS) 2.2.3 Software as a Service (SaaS) 2.3 Deployment Models 2.3.1 Public Cloud 2.3.2 Private Cloud 2.3.3 Hybrid Cloud 2.3.4 Community Cloud **Unit 3: Cloud Service Models** 3.1 Infrastructure as a Service (IAAS) 3.1.1 Introduction to Virtualization 3.1.1.1 Hypervisors, Virtual Machine, Machine Image 3.1.2 Resource Virtualization 3.1.2.1 Server, Storage, Network 3.1.3 Amazon EC2, Eucalyptus 3.2 Platform as a Service (PAAS) 3.2.1 Introduction to SOA 3.2.2 Cloud Platform 3.2.2.1 Computing 3.2.2.2 Storage 3.2.3 Introduction to Microsoft Azure 3.2.4 Introduction to Salesforce's Force.com 3.3 Software as a Service (SAAS) 3.3.1 Introduction 3.3.2 Web Service & Web OS

	Unit 4: Cloud Security 4.1 Infrastructure Security 4.2 Data Security and Storage 4.3 Identity and Access Management (IAM) 4.4 Access Control 4.5 Authentication in Cloud **Unit 5: Cloud Databases (DBaaS)** 5.1 AWS SimpleDB & RDS 5.2 AzureTable Service & SQL Azure 5.3 Introduction to BigTable 5.4 Introduction to Firebase
Reference Books	1. Cloud Computing Principles and Paradigms (Wiley) Rajkumar Buyya, James Broberg, Andrzej M. Goscinski 2. Cloud Computing: Principles, Systems and Applications Nikos Antonopoulos, Lee Gillam (Springer) 3. Enterprise Cloud Computing: Technology, Architecture, Applications Gautam Shroff - Cambridge University Press 4. Cloud and Virtual Data Storage Networking Greg Schulz - Auerbach 5. Cloud Security: A Comprehensive Guide to Secure Cloud Computing Ronald L Krutz, Russel Dean Vines (John Wiley & Sons) 6. Cloud Computing (David Crookes - TMH Education) 7. Cloud Computing Bible Barrie Sosinsky (Wiley India) 8. Cloud Computing: Implementation, Management and Security (James F Ransome, John W Rittinghouse - CRC Press) 9. Amazon Cloud Computing with Java (Aditya Yadav - Lulu.com) 10. Grid and Cloud Database Management Fiore, Sandro, Aloisio, Giovanni - Springer 11. Building a Database Cloud for Dummies Michael Wessler John Wiley & Sons
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 304: Programming in .NET

Course Code	304
Course Title	**Programming in .NET**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course is an introduction to students to understand fundamentals of .NET technology. The course also gives students an idea about VB.NET Programming. The course also explains the concept of ASP.NET
Course Objective	1. To make students understand .NET Technology 2. To make students understand VB.NET Programming 3. To make students understand the importance of ASP.NET
Pre-requisite	Nil
Course Out come	After studying the course, students will be able to understand how .NET Technology works and the importance of object oriented programming. This course will also help students to appreciate the VB.NET programming.
Course Content	**Unit1: Overview of Microsoft .NET Framework** 1.1 The .NET Framework 1.2 The Common Language Runtime (CLR) 1.3 The .NET Framework class Library 1.4 .NET Web Services **Unit2: Visual Basic .NET programming** 2.1 Working with Tool box controls 2.2 Working with Menus and Dialog Boxes 2.3 Tapping Errors Using Structured Error Handling 2.4 Using Modules and Procedures 2.5 Using Arrays and Collections **Unit3: Object Oriented Programming** 3.1 Creating Classes, Object Construction & Destruction 3.2 Class Libraries : DLL's & Static Classes 3.3 Abstraction, Encapsulation & Polymorphism 3.4 Interfaces & Inheritance 3.5 Object Serialization **Unit4: Multithreading, Files & Streams** **Unit5: Database access using ADO.NET** 5.1 Visual Database Tools 5.2 ADO.NET Object Model 5.3 ADO.NET Programming 5.4 Working with DataSets 5.5 Integration with XML 5.6 The Middle Tier [Self Study] Report Generation Deployment
Reference Books	1. Moving to VB.NET: Strategies, Concepts, and Code - Dan Appleman 2. Microsoft Visual Basic .NET Step By Step- Michael Halvorson – PHI 3. Database Programming with Visual Basic .NET and ADO.NET- F.

	Scott Barker - Sams Publishing 4. Beginning .NET Web Services Using Visual Basic .NET- Joe Bustos and Karlli Watson – Wrox Publication 5. .NET – Complete Development Cycle- G. Lenz, T. Moeller – Pearson Education 6. Professional VB.NET, 2nd Edition- Fred Barwell – et al - Wrox Publication 7. Mastering Visual Basic .NET Database Programming – Bilgin – BPB Publication 8. Visual Basic .Net Programming Black Book, Steven Lolzner – DreamTech Publication 9. The complete Reference-Visual Basic .Net –Jeffrey Shapiro- Osborne Publication
	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 305: Java Programming

Course Code	305
Course Title	**Java Programming**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course is an introduction to students to understand java programming. The course also gives students an idea about object oriented programming methodology.
Course Objective	1. To make students understand java programming. 2. To make students understand the importance of desktop and web application
Pre-requisite	Nil
Course Out come	After studying the course, students will be able to understand how to program java and the importance of various object oriented programming methodology.
Course Content	**Unit1: Fundamentals of Java** 1.1 Features of Java 1.2 Java Developer's Kit: Java Compiler, Java Interpreter, Java Debugger, Applet Viewer 1.3 Working with IDE 1.4 JVM & Bytecode 1.4 Primitive and Non-Primitive Data types 1.5 Variable and Reference variable 1.6 Operators & Expressions 1.7 Flow control statements 1.8 Working with Arrays & String **Unit2: Object Oriented Programming** 2.1 Classes and Objects 2.1.1 Fields & Methods 2.1.2 Object Creation, Construction and Initialization 2.1.3 Method and Constructor Overloading 2.2 Inheritance 2.2.1 Extending Class 2.2.2 Role of Constructors in inheritance 2.2.3 Inheriting and redefining members 2.2.4 Type computability and conversion 2.2.5 'This' & 'Super' Keyword 2.3 Interfaces 2.3.1 Abstract class & Interfaces 2.3.2 Defining & Extending Interfaces 2.3.3 Implementing Interfaces 2.4 Packages 2.4.1 Package Naming 2.4.2Package Access 2.4.3 Packages and CLASSPATH 2.4.4 Package Example 2.5 Overview of Streams 2.6 Bytes vs. Characters Streams 2.7 Converting Byte Streams to Character Streams 2.8 Basic and Filtered Streams 2.9 File Object 2.10 Reading and Writing to Files 2.11 Object Serialization

	2.12 Garbage Collection 2.13 Finalization 2.14 Interacting with Garbage Collector 2.15 Reachability States and Reference Objects **Unit3: Exception Handling & Threads** 3.1 Exception & Types of Exception 3.2 Use of try, catch, finally, throw, throws in Exception Handling 3.3 Control Flow in Exceptions 3.4 Creating User Defined Exceptions 3.5 Creating Threads 3.6 Extending Thread class 3.7 Implementing Runnable interface 3.8 Thread scheduling 3.9 Thread Synchronizing 3.10 Use of 'synchronized' keyword 3.11 wait, notify and notifyall methods 3.12 'volatile' modifier **Unit 4: Applets & GUI Programming** 4.1 Abstract Window Toolkit (AWT) Class 4.1.1 Components and Containers 4.1.2 Layout Managers 4.1.3 Classes for various controls: Labels, Buttons, Text Fields, Text Areas, Check Boxes and Choice List, etc... 4.2 Event Handling 4.2.1 Event Types & Classes 4.2.2 The Delegation Model of Event Handling: Event Classes, Event Sources & Event Listeners 4.2.3 Adapter Classes 4.3 Introduction to Applets 4.4 Applet Life Cycle Methods **Unit 5: Networking & JDBC** 5.1 URL Manipulation 5.2 InetAddress Class 5.3 Socket Overview 5.3.1 TCP and UDP Socket 5.3.2 Introduction of Java Classes: ServerSocket, Socket, DatagramSocket & DatagramPacket 5.3.3 Client Server Interaction with Stream Socket Connection 5.3.4 Datagrams: connectionless Client/Server Interaction 5.4 JDBC Drivers 5.5 Making a Connection with Database 5.6 Basis for Processing SQL Statements 5.7 Creating Statements: PreparedStatement 5.8 Executing Queries 5.9 Processing ResultSet Objects [Self Study] EJB – Overview
Reference Books	1. Java Programming Language– James Gosling, David Holmes Arnold - Addition Wesley 2. Java – The Complete Reference- Patrick Naughton - Tata McGraw Hill 3. Experiments with Java: An Introductory Lab Manuals -S.A. Robelsky - Addition Wesley

	4. Java 2 From Scratch-Stevens Halmes – PHI / pearson education PHI 5. Java: how to program, 9th Edition - Paul Deitel,Harvey Deitel- Tata McGraw Hill 6. Complete Reference- Peter Naughten
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 306: **Programming Skills V**

Course Code	306
Course Title	**Programming Skills V**
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	Give fundamental knowledge of Database Models, Oracle Database Server Architecture and Working knowledge of SQL & PL/SQL in Oracle.
Course Objective	To acquaint the students with Client Server Architecture in general and Oracle Architecture in particular. Also, to get working knowledge of SQL and PL/SQL programming
Pre-requisite	Nil
Course Outcome	After studying the course, students will be able to understand how Oracle Database works and the importance of various components of Oracle. This course will also help students to appreciate the role of a database administrator. After successful completion, students will be able to manage Oracle database and will be able to write codes in SQL & PL/SQL necessary for an application.
Course Content	Practical based on paper no 301. Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills VI**

Course Code	307
Course Title	**Programming Skills VI**
Credit	4
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course is an introduction to students to understand fundamentals of .NET technology. The course also gives students an idea about VB.NET Programming. The course also explains the concept of ASP.NET
Course Objective	1. To make students understand .NET Technology 2. To make students understand VB.NET Programming 3. To make students understand the importance of ASP.NET
Pre-requisite	Nil
Course Out come	After studying the course, students will be able to understand how .NET Technology works and the importance of object-oriented programming. This course will also help students to appreciate the VB.NET programming.
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate

	journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills VII**

Course Code	308
Course Title	**Programming Skills VII**
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course is an introduction to students to understand java programming. The course also gives students an idea about object-oriented programming methodology.
Course Objective	1. To make students understand java programming. 2. To make students understand the importance of desktop and web application
Pre-requisite	Nil
Course Out come	After studying the course, students will be able to understand how to program java and the importance of various object-oriented programming methodology.
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA 4th Semester

Course: 401: Android Application Programming

Course Code	401
Course Title	**Android Application Programming**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make student capable of implementing the concepts, methods and tools of mobile applications development using Android.
Course Objective	To provide a thorough introduction to the Android environment and tools for creating Android applications.
Pre-requisite	Basic concepts of Operating Systems, Programming skills in core Java and Knowledge of object-oriented programming is desirable. Knowledge XML format is helpful.
Course Out come	After completion of this course, the student will be capable to develop, manage and maintain mobile device-based application using Android.
Course Content	**Unit 1: Introduction to Android** 1.1 Evolution of Android and OHA 1.2 Architecture of Android OS 1.3 Introduction to Android SDK 1.4 Android Development tools: SDK Manager, Android Emulator, Android Virtual Device, Dalvik Debug Monitor Service (DDMS), Android Debug Bridge (ADB) 1.5 Anatomy of Android App: AndroidManifest.xml, Resources & R.java, Assets, Layouts & Drawable Resources **Unit 2: Working with User Interface in with Android Activity** 2.1 Widgets: Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, RadioGroup, ProgressBar, Text Fields, ListView, Spinner 2.2 Designing UI Layouts: LinearLayout, RelativeLayout, TableLayout 2.3 Toast and Dialogs: AlertDialogs, TimePicker, DatePicker 2.4 Menus: Option menu, Context menu 2.5 Adapters for data binding: Array adapter, Cursor adapter 2.6 Event callback methods: onClick(), onLongClick() and onTouch() **Unit 3: Android Application Components** 3.1 Activity and Activity lifecycle 3.2 Intents and Intent Filters 3.3 Implicit Intent and Explicit Intent 3.4 Linking of Activity using Intent: startActivity() & startActivityForResult() 3.5 Fragments 3.6 Introduction to Service: life cycle, creation and destroy 3.7 Broadcast receiver & notification **Unit 4: Data Persistency in Android** 4.1 Shared preferences 4.2 File I/O Access: internal and external files 4.3 Working with SQLite Database - Performing insert, update, delete and query operations 4.4 Data access through web services (external databases) 4.5 Working with inbuilt Content Provider: CallLogs, Contacts

	Unit 5: Telephony APIs, Sensors and Leveraging Google APIs 5.1 Telephony APIs 5.1.1 Working with Telephony utilities 5.1.2 Sending and receiving SMS 5.2 Location and Map 5.2.1 Incorporating Location APIs 5.2.2 Incorporating Google map 5.2.3 Geocoding and reverse Geocoding
Reference Books	1. Beginning Android 4 Application Development, WEI-MENG LEE, WROX Publication-Wiley-India 2. Professional Android 4 Application Development by Reto Meier WROX Publication-Wiley-India 3. Android Programming Unleashed, B.M. Harwani, Sams Publishing 4. Beginning Android 4 Onur Cinar Apress Publication 5. Advanced Android Application Development, Fourth Edition, By Shane Conder, Lauren Darcey, Joseph Annuzzi Jr., Pearson
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 402: Information Systems

Course Code	402
Course Title	**Information Systems**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make student capable of learning in depth, the different types of Information Systems
Course Objective	The objective of the course is - 1. To provide a thorough introduction to the different types of Information systems (IS) and also developing different types of IS applications. 2. To impart knowledge of manufacturing and services industries and the various business process involved in these systems 3. Learn advanced systems and technologies for acquiring entrepreneurship sills.
Pre-requisite	Fundamental knowledge of software systems, software engineering
Course Out come	After completion of this course, the student will be capable to develop, distinguish, manage and maintain Information systems. The student will be capable for developing different types of Information systems and IS reports; and enhance the skills of individual as an entrepreneur and IS professional.
Course Content	**Unit 1: Managing the Digital Firm & Information System in the Enterprise** 1.1 Need of Information System 1.1.1 What is an Information System? 1.1.2 Competitive Business Environment 1.1.3 A Business Perspective on Information Systems 1.2 Approaches to Information Systems 1.2.1 Technical Approach 1.2.2 Behavioral Approach 1.2.3 Socio-technical Systems 1.3 The role of Information System 1.3.1 Scope of Information System 1.3.2 Organizational Design 1.3.3 Electronic Commerce and Electronic Business 1.4 Use of Information System 1.4.1 Challenge of Information Systems 1.5 System Applications in the Organization 1.5.1 Kinds of Information Systems 1.5.2 Types of Information Systems 1.5.3 Relationship of systems with one another 1.6 MIS Development Process 1.7 Functional Perspective of System 1.7.1 Various Information Systems like Sales and Marketing, Manufacturing and Production, Financial and Accounting, Human Resource etc. 1.7.2 Difference between Information Requirements of a Manufacturing Sector and Service Sector 1.8 Integrating Functions and Business Processes 1.8.1 Business Processes and Information System 1.8.2 Customer Relationship Management (CRM) and Supply Chain Management 1.8.3 Enterprise Systems 1.8.4 Vertical and Horizontal Industrial Networks 1.9 Difference between general reports and MIS reports 1.10 Difference among General Software Projects, Turn-Key Projects and Legacy Systems

Unit 2: Information System, Organizations, Management and Strategy, E-Commerce & E-Business

2.1 Relationship of an Organization with Information System
- 2.1.1 What is an Organization?
- 2.1.2 Features of Organization

2.2 Role of Information System in Organizations
- 2.2.1 How Information System affect Organization?
- 2.2.2 Implications for the design and Understanding of Information System

2.3 Relationship of Manager, Decision Making and Information Systems

2.3.1 Role of Managers in Information System
- 2.3.2 Managers and Decision Making

2.4 Information System and Business Strategies
- 2.4.1 What is Strategic Information System?
- 2.4.2 Business Level Strategy and Value Chain Model
- 2.4.3 Supply Chain Management and Efficient Customer Response system

2.5 Electronic Commerce and Electronic Business
- 2.5.1 Emerging Trends
  - 2.5.1.1 New Business Models
- 2.5.2 Electronic Commerce
- 2.5.3 Electronic Commerce Payment Systems
- 2.5.4 Electronic Business and Digital Firm
- 2.5.5 Challenges and Opportunities of E-Commerce

Unit 3: Knowledge Based Systems

5.1 Knowledge Management in Organization
- 5.1.1 System and Information of Knowledge Management
- 5.1.2 Knowledge Work and Productivity

5.2 Information and Knowledge Work System
- 5.2.1 Office and Document Management System
- 5.2.2 Creating Knowledge Work System
- 5.2.3 Group Collaboration System

5.3 Use of Artificial Intelligence in Business

Unit 4: Decision Making

4.1 Decision Support System (DSS)
- 4.1.1 Relationship of MIS and DSS
- 4.1.2 Types of Decision Support System
- 4.1.3 Components of Decision Support System
- 4.1.4 Decision Support System Applications

4.2 Group Decision Support System (GDSS)
- 4.2.1 What is Group Decision Support System?
- 4.2.2 Characteristics of Group Decision Support System
- 4.2.3 Importance of Group Decision Support System

4.3 Executive Support System (ESS)
- 4.3.1 Role of Executive Support System
- 4.3.2 Development of Executive Support System
- 4.3.3 Advantage of Executive Support System

Unit 5: Control and Security of Information System

5.1 Threats to Information Systems

5.2 System Quality Problems
- 5.2.1 Software and Data Quality Problems

5.3 Difference between Safety and Security of Information Systems

5.4 Control Environment

	5.4.1 General Controls and Application Controls 5.4.2 Security issue on E-Commerce 5.4.3 Control Structure Development
Reference Books	1. Management Information System : Managing A Digital Firm – 9th Ed., Kenneth C. Laudon & Jane P. Laudon, Pearson Education, Second Indian Reprint 2. Principles of Information Systems – A Managerial Approach, 9th Ed., Ralph M. Stair & George W. Reynolds, Course Technology – Cengage Learning 3. Management Information system, W.S. Jawadekar, Tata McGraw-Hill 4. Information Systems Management In Practice, Sixth Edition, B.C. McNurlin, R.H. Sprague, Pearson Education 5. Information Systems for Modern Management, Murdick, Ross and Claget, Prentice Hall
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 403: Data Communication and Network Protocols

Course Code	403
Course Title	**Data Communication and Network Protocols**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to Learn Advanced concepts of Network Protocols and Data Communication.
Course Objective	The objective of the course is - 1. To provide a thorough introduction to the Network concepts. 2. To implement knowledge of all network concepts in real world.
Pre-requisite	Basic concepts of Concepts of Computer Networks
Course Out come	After completion of this course, the student will be capable to understand and implement networking concepts.
Course Content	**Unit 1: Introduction to Networks and IP addressing** 1.1 Review of ISO OSI reference model 1.2 Introduction to TCP/IP protocol suite 1.3 Classful addressing 1.4 Classless addressing 1.5 Network mask, Subnet mask and Masking 1.6 Sub netting **Unit 2: IP Protocol and Packet forwarding** 2.1 Introduction 2.1.1 Datagram 2.1.2 Fragmentation 2.1.3 Options 2.1.4 Checksum 2.1.5 Utilities 2.2 IP packets Delivery 2.3 Forwarding and routing of IP packets 2.3.1 Forwarding - Methods 2.3.2 Forwarding with classful Addressing 2.3.2.1 Forwarding without Subnetting 2.3.2.2 Forwarding with Subnetting 2.3.3 Forwarding with classless Addressing 2.4 Address Aggregation **Unit 3: ARP, RARP & ICMP** 3.1 Introduction 3.2 ARP, RARP Packet formats 3.3 ARP, RARP Encapsulation 3.4 Operation 3.5 Proxy ARP 3.6 RARP server 3.7 ICMP 3.7.1 Introduction 3.7.2 Message Types 3.7.3 Message format 3.7.4 Introduction to Error reporting and Query messages 3.7.7 Debugging tools - Ping, Traceroute **Unit 4: Wireless MAC and Routing Protocols** 4.1 The channel allocation problem

	4.2 Wireless LAN 4.2.1 IEEE 802.11 - Architecture and Services 4.2.2 IEEE 802.11 - Operating modes (AdHoc mode, Infrastructure mode) 4.3 MAC (Media Access Control): ALOHA, CSMA, MACA, MACAW 4.4 Routing Protocols: DSDV, DSR **Unit 5: UDP & TCP** 5.1 UDP 5.1.1 Introduction 5.1.2 User datagram 5.1.3 Checksum 5.1.4 Operation 5.1.5 UDP usage 5.2 TCP 5.2.1 Services 5.2.2 Features 5.2.3 Segment 5.2.4 Connection 5.2.5 State transition diagram 5.2.6 Flow control 5.2.7 Error control 5.2.8 Congestion control **Self-study:** Study of IP next generation including IPSec. Development and demonstration of network software tools using above protocols.
Reference Books	1. TCP/IP Protocol Suite 4th edition, Behrouz A. Forouzan, Tata McGraw Hill 2. TCP/IP Illustrated Vol. – 1&2, W. Richard Stevens 3. Data and Network Communication, M.A. Miller, Thomson Learning 4. Data Communication and Networks, A.S. Godbole, Tata MCGraw Hill 5. Introduction to Data Communication & Networking Wayne Tomasi, Pearson Ed. 6. C. Siva Ram Murthy and B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall PTR
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 403: Cyber Security & Forensics

Course Code	403
Course Title	**Cyber Security & Forensics**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	To understand the major concepts of Cyber Security and Forensics
Course Objective	To teach the concepts of Cyber Security and Forensics and how it can be applied to various components to make the complete application environment secured.
Pre-requisite	Basic knowledge of Computer Networking, Web Application and File Structures.
Course Out come	After completion of this course, the students will be in a position to take up cyber forensics as career as well as those who want to seek careers in cyber security and to gain experience of doing independent study and research in the field of cyber security and cyber forensics.
Course Content	**Unit 1: Introduction to Information Security, Threats and Cyber Crime** 1.1 Introduction to Information Security, Data Security and Cyber Security 1.2 Information Security overview 1.3 Types of Attacks 1.4 E-Commerce Security 1.5 Security Threats and Vulnerabilities 1.5.1 Overview of Security threats 1.5.2 Weak / Strong Passwords and Password Cracking 1.5.3 Insecure Network connections 1.5.4 Malicious Code 1.5.5 Programming Bugs 1.6 Cyber Crime 1.6.1 Cyber-crime and Cyber terrorism 1.6.2 Information Warfare 1.6.3 Surveillance 1.7 Introduction to Cryptography 1.7.1 Symmetric and Asymmetric Key Cryptography 1.7.2 Digital Signature 1.7.3 Public Key Infrastructure 1.8 Information Hiding & Steganography **Unit 2: Security Management and Laws** 2.1 Security Management Practices 2.1.1 Overview of Security Management 2.1.2 Information Classification Process 2.1.3 Security Policy 2.1.4 Risk Management 2.1.5 Security Procedures and Guidelines 2.1.6 Business Continuity and Disaster Recovery 2.2 Security Laws 2.2.1 Security Assurance 2.2.2 Security Laws 2.2.3 IPR 2.2.4 Security Audit **Unit 3: Network Security** 3.1 Access Control and Intrusion Detection 3.1.1 Overview of Identification and Authorization 3.1.2 Overview of Intrusion Detection System (IDS) 3.1.3 Intrusion Detection and Prevention Systems (IDPS)

	3.2 Server Management and Firewalls 3.2.1 User Management 3.2.2 Overview of Firewalls 3.2.3 Types of Firewalls 3.2.4 DMZ and firewall features **Unit 4: Digital Forensics** 4.1 Overview of digital investigation and digital evidence 4.2 Data Acquisition of physical storage devices 4.3 Study of file systems with a main focus on Microsoft Windows & Linux Systems 4.4 File System Analysis & file recovery 4.5 Data Recovery using specialized tools [Demonstration using any one or two data recovery tools] 4.6 Introduction to Email forensics **Unit 5: Web Security and Mobile Security** 5.1 Web Hacking Basics 5.2 HTTP & HTTPS URL 5.3 E-mail Security: PGP and SMIME 5.4 Overview of Java security 5.5 Mobile Application Security Basics
Reference Books	1. Donn Parkers, "Fighting Computer Crime: A New Framework for Protecting Information", John Wiley & Sons 2. Micki Krause, Harold F.Tripton, " Information Security Management Handbook", Auerbach Publications 3. Nina Godbole, Sunit Belapur, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Publications, April 4. James Graham, Richard Howard, Ryan Olsan, "Cyber Security Essentials" CRC Press 5. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, "Cyber Security Policy Guidebook" Wiley Publications 6. Albert J. Marcella, Jr. Doug Menendez, "CYBER FORENSICS: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes", Auerbach Publications 7. Robert Jones, "Internet Forensics: Using Digital Evidence to Solve Computer Crime", O'Reilly Media, October 8. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi 9. Behrouz A.Forouzan, "Cryptography & Network Security", Tata McGraw Hill, India, New Delhi 10. William Stallings, "Cryptography and Network Security, Prentice Hall, New Delhi 11. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York 12. Nichols and Lekka, "Wireless Security-Models, Threats and Solutions", Tata McGraw – Hill, New Delhi 13. Merritt Maxim and David Pollino, "Wireless Security", Osborne/McGraw Hill, New Delhi 14. Nelson B, Phillips A, Enfinger F, Steuart C, "Guide to Computer Forensics and Investigations", 4thedition, Course Technology
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 404: Interactive Computer Graphics

Course Code	404
Course Title	**Interactive Computer Graphics**
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make student capable of implementing the concepts, methods and tools of Interactive Computer Graphics
Course Objective	The objective of the course is - 1. To provide a thorough introduction to the graphics environment and tools for creating graphics applications. 2. To impart knowledge of Interactive Computer Graphics.
Pre-requisite	Basic concepts of Operating Systems & Programming skills
Course Out come	After completion of this course, the student will be capable to develop, manage and maintain Interactive Computer Graphics. The student will be capable for working with graphics platform.
Course Content	**Unit 1: Introduction to Computer Graphics** 1.1 Image Processing as Picture Analysis 1.2 Advantages of Computer Graphics 1.3 Applications of Computer Graphics 1.4 Basic Input and Output Technology used in Interactive Computer Graphics 1.5 Graphics Standards **Unit 2: Display Devices & Basic Raster Graphics Algorithms** 2.1 Display Devices 2.1.1 Hardcopy Display Devices 2.1.2 Display Technology 2.1.3 Raster-Scan Display 2.1.4 Video Controller 2.1.5 Image Scanners 2.2 Basic Raster Graphics Algorithms 2.2.1 Frame Buffers and Display Controllers 2.2.2 The output pipeline 2.2.3 Scan Converting Lines 2.2.3.1 Incremental Algorithm 2.2.3.2 Midpoint Line Algorithm 2.2.3.3 Thick Line Drawing 2.2.4 Scan Converting Circles 2.2.4.1 Eight-Way Symmetry 2.2.4.2 Midpoint Circle Algorithm 2.2.5 Scan Converting Ellipses **Unit 3: Polygons** 3.1 Polygons and its representation 3.2 Inside Tests 3.2.1 Even-odd Method 3.2.2 Winding Number Method 3.2.3 Method of Index 3.3 Filling polygons 3.3.1 Flood Fill 3.3.2 Scan Line Fill 3.3.3 Boundary Fill 3.4 Pattern Filling

	3.5 Line Styles and Pen Style 3.6 Character Generation **Unit 4: Windowing and Clipping** 4.1 Definition of Windowing and Clipping 4.2 Viewing Transformation 4.3 Point Clipping 4.4 Clipping Lines 4.4.1 Line clipping by Solving Simultaneous Equations 4.4.2 Cohen – Sutherland Line Clipping Algorithm 4.4.3 Liang – Barskey Algorithm 4.4.4 Midpoint Subdivision Algorithm 4.5 Clipping Circles and Ellipses 4.6 Clipping Polygons 4.6.1 Sutherland Hodgman Polygon Clipping Algorithm 4.7 Text Clipping **Unit 5: Advanced graphics, Modelling & Animation** 5.1 Transformations 5.1.1 2D Transformations 5.1.2 Homogeneous Coordinated 5.1.3 Composite 2D Transformation 5.1.4 The Viewing Transformation 5.1.5 Matrix representation of 3D Transformations 5.1.6 Composite 3D Transformations 5.1.7 Transformation as a change in Coordinate System 5.2 Viewing in 3D 5.2.1 Projections 5.2.2 Specifying an Arbitrary 3D View 5.2.3 3D Views 5.3 Geometric Modelling 5.3.1 Introduction 5.3.2 Characteristics and retained mode Graphics Packages 5.3.3 Defining and Displaying Structures 5.4 Introduction to Illumination and Shading 5.5 Image Manipulation and Storage 5.5.1 Introduction to Image 5.5.2 Filtering 5.5.3 Image Processing 5.5.4 Image Composition 5.5.5 Image Storage 5.5.6 Special Effects with Image 5.6 Animation 5.6.1 Design of Animation Sequences 5.6.2 Key Frame Systems 5.6.2.1 Morphing 5.6.2.2 Simulating Acceleration 5.6.3 Motion Specifications 5.6.3.1 Direct Motion Specification 5.6.3.2 Goal Directed Systems 5.7 Introduction to OpenGL 5.7.1 Open GL Pipeline 5.7.2 Overview of OpenGL routine 5.7.2.1 OpenGL bitmap function 5.7.2.2 OpenGL output primitives **Self-study:** OpenGL 2D function

Reference Books	1. Computer Graphics: Principles & Practice Second Ed. in C-Foley, Van Dam, Feiner, Hughes-Pearson Education, Eleventh Indian Reprint. 2. Computer Graphics- Apurva A Desai- PHI Learning 3. Computer Graphics C Version- Donald Hearn & M. Pauline Baker-Pearson Education, Fifth Indian Reprint 4. Computer Graphics -Herrington S. Prentice Hall - 5. Principles of Interactive Graphics- Newman & Sproul -McGraw Hill 6. Interactive Computer Graphics- Giloi W.K. Prentice Hall - 7. Computer Graphics with Multimedia- A Rajaraman - Narosa 8. Computer Graphics with OpenGL- Hearn, Baker-Pearson, IIIrd Edition
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 404: Cryptography

Course Code	404
Course Title	**Cryptography**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	To understand the major concepts of Cryptography
Course Objective	To teach the concepts of Cryptography and its practical applications.
Pre-requisite	Basic concepts of Mathematics & Programming skills
Course Out come	After completion of this course, the student will be able to analyse the vulnerabilities in any computing system and hence be able to design a secure solution
Course Content	**Unit 1: Introduction to Cryptography** 1.1 Introduction – Symmetric, Asymmetric, Protocols 1.2 Linear Feedback Shift Registers (LFSR) 1.3 Fermat and Euler's theorem 1.4 Block Ciphers 1.5 Stream Ciphers 1.6 Self-Synchronizing Stream Ciphers 1.7 Block Cipher versus Stream Cipher 1.8 Modes of Operation (ECB, CBC, CFB, OFB, CTR) **Unit 2: Symmetric-Key Cryptography** 2.1 Shannon's Theory 2.2 Feistel Cipher 2.3 Simple DES 2.4 Triple DES 2.5 AES – Advanced Encryption Standard 2.6 Differential Cryptanalysis 2.7 RC4 **Unit 3: Asymmetric-Key Cryptography & Digital Signature** 3.1 RSA 3.2 Diffie-Hellman key exchange 3.3 ElGamal Encryption 3.4 Digital Signatures – RSA – ElGamal 3.5 Digital Signature Algorithm (DSA) **Unit 4: Hash Functions** 4.1 Hash Functions 4.2 MD5 4.3 Collision Resistance and the Birthday Attack 4.4 Secure Hash Algorithms (SHAs) **Unit 5: MACs & Protocols** 5.1 Message Authentication Codes (MACs) 5.2 Shamir's Three-Pass Protocol 5.3 Key Establishment Using Symmetric-Key Techniques 5.3.1 Key Distribution Center (KDC) – Security (Attacks: Replay, Key Confirmation) 5.3.2 Kerberos 5.3.3 Problems with Symmetric-Key Distribution 5.4 Key Establishment Using Asymmetric Techniques 5.4.1 Man-in-the-Middle Attack (MITM) 5.4.2 Certificates

	5.4.3 Public-Key Infrastructures (PKI) and CAs
Reference Books	1. Christof Paar, Jan Pelz, "Understanding Cryptography", Springer, 2nd edition 2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", Pearson, 2nd edition 3. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI, 4th edition 4. W. Mao, "Modern Cryptography Theory and Practice", Pearson Education, Secon d edition 5. Charles P. Pfleeger, Shari Lawrence Pfleeger Security in computing Third Edition – Prentice Hall of India 6. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C" John Wiley & Sons, Inc, 2nd Edition 7. Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education 8. Atul Kahate, "Cryptography and Network Security", Tata McGrew Hill 9. William Stallings, "Cryptography and Network Security, Prentice Hall, New Delhi 10. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, New Delhi
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 405: **Front-end Technologies**

Course Code	405
Course Title	**Front-end Technologies**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	To understand the concepts of HTML, CSS, Front-end Scripting technologies
Course Objective	To teach the concepts of Front-end Scripting and its practical applications.
Pre-requisite	Basic concepts of HTML, Web & Programming skills
Course Out come	After completion of this course, the student will be able to design and develop web pages and Interactive UI for Web Applications
Course Content	**Unit 1: Fundamentals of Web Technology** 1.1 HTML 1.1.1 Basic HTML tags 1.1.2 HTML Forms 1.2 HTML5 1.2.1 HTML5 new elements 1.2.2 HTML5 Form elements 1.2.3 HTML5 Attributes 1.2.4 Canvas 1.2.5 Video and Audio 1.2.6 Web storage 1.2.7 Geolocation 1.2.8 HTML 5 APIs 1.3 CSS3 1.3.1 Introduction to CSS3 1.3.2 Selectors and Classes 1.3.3 Font and Text effect 1.3.4 Colors, Gradients, Background Images, and Masks 1.3.5 Border and Box effects etc. 1.3.6 Embedding Media 1.4 JavaScript 1.4.1 Fundamentals of JavaScript 1.4.2 Syntax of JavaScript 1.4.3 Use of JavaScript in HTML 1.4.4 Validation using JavaScript 1.4.5 DOM **Unit 2: Introduction to Bootstrap** 2.1 What is Bootstrap 2.1.1 What is Responsive web page 2.1.2 Advantages and features of Bootstrap 2.1.3 Setup Environment 2.1.4 Apply bootstrap to Application 2.2 Bootstrap with CSS 2.2.1 Grid system 2.2.2 Typography 2.2.3 Code, table, forms, buttons, image, responsive utilities etc. 2.3 Bootstrap components 2.3.1 What is Bootstrap components 2.3.2 Advantages of components 2.3.3 Types of Bootstrap components

	2.3.3.1 Glyphicons, Drop downs, button group, input groups navigation, pagination etc. **Unit 3: JQuery** 3.1 Introduction to JQuery 3.1.1 Syntax, Attributes, Selectors, Events 3.2 JQuery Effects 3.2.1 Hide/Show, Fade, Slide, Animation etc. 3.2.2 JQuery with HTML 3.3 Traversing 3.4 JQuery and AJAX **Unit 4: AJAX and JSON** 4.1 Ajax Basics 4.1.1 HTTP Request and Response Fundamentals 4.1.2 The XMLHttpRequest Object XMLHttpRequest Methods 4.1.3 XMLHttpRequest Properties 4.1.4 Cross-Browser Usage Sending a Request to the Server 4.1.5 Server-Side Processing Expanding and Contracting Content 4.1.6 Form Validation 4.1.7 Ajax-Based Database Querying using any one server site scripting language 4.2 JSON 4.2.1 JSON Basics 4.2.2 Syntax 4.2.3 Datatype, Parse, Stringify, Objects, Array 4.2.4 Use of JSON using any one server site scripting **Unit 5: Introduction to Angular JS** 5.1 Introduction to AngularJS 5.2 Directives, Expressions, Controllers, Filters, Tables, Html DOM 5.3 Modules, Forms, Includes, Views 5.4 Angular SQL 5.5 AngularJS Applications
Reference Books	1. Responsive Web Design with HTML5 and CSS3 By Ben Frain - Packt Publishing Ltd. 2. HTML, CSS & JavaScript Web Publishing in One Hour a Day, Sams Teach Yourself by Laura Lemay, Rafe Colburn, Jennifer Kyrnin – Sams Publication 3. Training Guide Programming in HTML5 with JavaScript and CSS3 (MCSD): 70-480 by Glenn Johnson - Pearson Education 4. Learning Bootstrap by Aravind Shenoy, Ulrich Sossou - Packt Publishing Ltd. 5. Professional AngularJS by Valeri Karpov, Diego Netto - John Wiley & Sons 6. Ajax: Creating Web Pages with Asynchronous JavaScript and XML - Edmond Woychowsky - Prentice Hall
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 406: **Programming Skills VIII**

Course Code	406
Course Title	**Programming Skills VIII**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make student capable of implementing the concepts, methods and tools of mobile applications development using Android.
Course Objective	To provide a thorough introduction to the Android environment and tools for creating Android applications.
Pre-requisite	Basic concepts of Operating Systems, Programming skills in core Java and Knowledge of object-oriented programming is desirable. Knowledge XML format is helpful.
Course Outcome	After completion of this course, the student will be capable to develop, manage and maintain mobile device-based application using Android.
Course Content	Practical based on paper no 401. Separate journal to be prepared for this subject 401.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 407: **Programming Skills IX**

Course Code	407
Course Title	**Programming Skills IX**
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	This course helps students to implement the advanced concepts of Computer Graphics/Cryptography practically.
Course Objective	Learning to implement the advanced topics of Computer Graphics/Cryptography practically.
Pre-requisite	Basic concepts of Operating Systems & Programming skills
Course Outcome	After studying the course, students will be able to practically work on Computer Graphics/Cryptography.
Course Content	Practical based on paper no 404. Separate journal to be prepared for this subject 404.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 408: **Programming Skills X**

Course Code	408
Course Title	**Programming Skills X**
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	To understand the concepts of HTML, CSS, Front-end Scripting technologies
Course Objective	To teach the concepts of Front-end Scripting and its practical applications.
Pre-requisite	Basic concepts of HTML, Web & Programming skills
Course Outcome	After completion of this course, the student will be able to design and develop web pages and Interactive UI for Web Applications
Course Content	Practical based on paper no 405. Separate journal to be prepared for this subject 405.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Veer Narmad South Gujarat University, Surat
MCA : Semester 4
Course 404 : Python and Introduction to Machine Learning (Elective)

Course Code	**404 (Elective)**
Course Title	**Python and Introduction to Machine Learning**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Medium of Instruction	English
Last Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make students capable of understanding and implementing Machine Learning concepts using Python language
Course Objective	To provide a comprehensive knowledge of Python language and to give introductory knowledge of machine learning concepts.
Pr-requisite	Basic Programming aptitude, Mathematical concepts
Course Out come	After completion of this course, the student will be capable of following; Develop programs using Python language, implement supervised machine learning algorithms using Python
Course Content	Unit 1 : 1.1 Introduction to Python Language and Interpreter 1.2 Python Data Types : Numeric, Boolean, Collection Types – String, Bytes and Byte attars, Tuples, Lists, Dictionaries, Sets 1.2 Control Statements and Iterations 1.3 Input and Output 1.4 Exception Handling 1,5 Testing and Debugging Unit 2 2.1 Functions and Abstraction 2.1.1 Function and its scope 2.2 Recursive functions 2.3 Creating and Using Modules and Packages 2.4 File handling 2.5 Date and Time Unit 3 3.1 Objects and Class 3.1.1 Abstract Data Types 3.1.2 Inheritance 3.1.3 Encapsulation 3.2 Plotting in Python Unit 4 4.1 Introduction to Machine Learning 4.2 Types of Machine Learning 4.2.1. Supervised Learning 4.2.2 Unsupervised Learning 4.2.3 Reinforcement Learning 4.3 Supervised Learning Algorithms 4.3.1 kNN Algorithm 4.3.2 Tree Classifier 4.3.3 Naive Bayes Classifier

	4.4 Regression Techniques 4.4.1 Linear Regression 4.4.2 Logistic Regression 4.4.3 Polynomial Regression 4.5 Cross Validation
Reference Book	1. Python Projects, Laura Cassell, Alan Gauld, Wrox Publication 2. Introduction to Computation and Programming Using Python, John V. Guttag, MIT Press 3. Core Python Programming, R. Nageshwar Rao, Dreamtech Publication 4. Python The Complete Reference, Martin C. Brown, McGraw Hill Publication 5. Exploring Python, Timothy A. Budd, McGraw Hill Publication 6. Machine Learning in Action, Peter Harrington, DreamTech Publication 7. Machine Learning, Thomas Mitchell, McGtraw Hill Publication 8. Applied Machine Learning, Madan Gopal, McGraw Hill Publication