



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-મગદલા 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/૫૮૩૮/૨૦૨૦

તા. ૧૬/૦૭/૨૦૨૦

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

**વિષય :-** એમ.એસસી (આઈ.ટી) સેમેસ્ટર-૯ અને ૧૦ ના અભ્યાસક્રમ બાબત.

સુજાશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૦-૨૦૨૧ થી એમ.એસસી. (આઈ.ટી.) સેમેસ્ટર - ૯ અને ૧૦ નો રીવાઈઝડ અભ્યાસક્રમ અંગે ઈન્ફોર્મેશન ટેકનોલોજીની વિષયની એડહોક (નિયુક્ત) સમિતિની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંક: ૨ 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 : ૯૮ અન્વયે મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્દુપરાંત તેનો અમલ કરવો.

**ઈન્ફોર્મેશન ટેકનોલોજીની વિષયની એડહોક (નિયુક્ત) સમિતિની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંક: ૨**

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૦-૨૦૨૧ થી એમ.એસસી. (આઈ.ટી.) સેમેસ્ટર - ૯ અને ૧૦ નાં અભ્યાસક્રમને રીવાઈઝડ કરવા 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 ક્રમાંક: ૯૮**

:: આથી ઠરાવવામાં આવે છે કે, ઈન્ફોર્મેશન ટેકનોલોજીની વિષયની એડહોક (નિયુક્ત) સમિતિએ તેની તા.૨૩/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંક: ૨ અન્વયે ભલામણ કરેલ અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિદ્યાશાખાવતી સ્વીકારેલ શૈક્ષણિક વર્ષ ૨૦૨૦-૨૦૨૧ થી એમ.એસસી. (આઈ.ટી.) સેમેસ્ટર- ૯ અને ૧૦ નાં રીવાઈઝડ અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

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.

R-B R-11  
16-07-20  
ઈ.ચા.કુલસચિવ

## Course : IT 901 : Internet of Things

Course Code	901
Course Title	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 to provides way to understand concept of Internet of Things (IoT) Architecture, various protocols and implementation of IOT Applications.
Course Objective	To provide understanding of IoT application development process, IOT reference architecture, concept of data communication in IoT and usage of development platforms & Tools.
Pre-requisite	Basic concepts of Programming and Computer Network
Course Out come	After completion of this course students will be able to understand IOT reference architecture and IoT application development process.
Course Content	<p><b>Unit : 1: Introduction of IOT</b></p> <ol style="list-style-type: none"> <li>1.1 Introduction of IOT,</li> <li>1.2 Introduction of IOT reference architecture and IOT reference model</li> <li>1.3 IOT application fields.</li> <li>1.4 Threads and security issues with IOT system.</li> <li>1.5 IOT case studies</li> </ol> <p><b>Unit : 2: IOT hardware platforms of IOT end devices</b></p> <ol style="list-style-type: none"> <li>2.1 Sensing devices and smart IOT end points : Sensors, sensor devices and Input devices, actuators</li> <li>2.2 Introduction of Embedded system and its role in IOT</li> <li>2.3 Embedded system microcontroller architecture :8-bit microcontroller: 8051, 32 bit microcontroller: ARM</li> <li>2.4 Introduction IOT system educational Hardware development platforms: Arduino and Raspberry Pi</li> <li>2.5 Introduction of Raspberry Pi hardware Peripherals</li> </ol> <p><b>Unit : 3: IOT communication Protocols and information theory</b></p> <ol style="list-style-type: none"> <li>3.1 RF energy and theoretical range</li> <li>3.2 Short range communication used in IOT: Non-IP based and IP based WPAN (Wireless personal area network) and its protocols</li> <li>3.3 Long rang communication(LPWAN) used in IOT and its protocols</li> <li>3.4 IOT edge to cloud protocols, Cloud service models</li> <li>3.5 Introduction of Data management system for IOT</li> </ol> <p><b>Unit : 4: Software Installation and Python Programming</b></p> <ol style="list-style-type: none"> <li>4.1 Overview of Raspberry Pi (RPI) hardware platforms and Compatible operating systems</li> <li>4.2 Setup and Install of Operating System on Raspberry Pi</li> <li>4.3 Raspbian OS package Installation and updating process.</li> <li>4.4 Overview of Super user privileges, Linux commands, Navigating file system, Integration with file and source code over internet through command line interface in Raspberry Pi</li> <li>4.5 Working with Python script.</li> <li>4.6 Dictionary concept in Python.</li> <li>4.7 Formatting number and dates in Python.</li> <li>4.8 File handing in Python</li> <li>4.9 Exception handling in Python</li> <li>4.10 Command line arguments in Python</li> </ol> <p><b>Unit : 5: Building IoT Applications using various Development Platforms</b></p> <ol style="list-style-type: none"> <li>5.1 Interface with various types of sensors using Arduino and Raspberry Pi.</li> <li>5.2 Working with various types of I/O and Peripherals of Raspberry Pi</li> <li>5.3 Working with database in IOT.</li> </ol>

	<p>5.4 Introduction of open source tools supported by Raspberry pi for IoT.</p> <p>5.5 IOT Application development using open source tool.</p> <p>5.5.1 Implementation of IoT Communication Models and Protocols.</p> <p>5.5.2 IoT Applications with Data Logging and Reporting</p>
Reference Book	<ol style="list-style-type: none"> <li>1. Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017</li> <li>2. Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015</li> <li>3. Internet of Things: Technologies and Applications for a New Age of Intelligence, Vlasios Tsiatsis, Stamatias Karnouskos and Jan Holler, Academic Press, 2018</li> <li>4. Raspberry Pi Cookbook, Simon Monk, O'Reilly Publishing Limited, 2014</li> <li>5. The Internet of Things, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2018</li> <li>6. Designing the Internet of Things, Adrian McEwen &amp; Hakim Cassimally, Wiley, 2018</li> <li>7. The Internet of Things, Hakima Chaouchi, Wiley, 2017</li> <li>8. Linux Lab: Hands on Linux, dreamtech Press, 2012</li> <li>9. Python Machine Learning by Sebastian Raschka, Packt, 2015</li> <li>10. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili, Packt, 2017</li> <li>11. Machine Learning using Python by U Dinesh Kumar and Manaranjan Pradhan, Wiley, 2019</li> </ol>
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	<p>30% Internal assessment</p> <p>70% External assessment</p>

Course : IT 902 : Machine Learning using Python

Course Code	902
Course Title	Machine Learning using Python
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 and implement Machine Learning concepts using Python language
Course Objective	To impart a comprehensive knowledge of Python language and machine learning concepts.
Pre-requisite	Basic concepts of Programming, Mathematical and Statistics
Course Out come	After completing the course student will be able to develop programs using Python language and implement supervised and unsupervised machine learning algorithms.
Course Content	<p><b>Unit : 1: Introduction to Machine Learning</b></p> <ol style="list-style-type: none"> <li>1.1 Overview of ML</li> <li>1.2 Applications of ML</li> <li>1.3 ML types</li> <li>1.4 ML Tools</li> <li>1.5 Characterization of Machine Learning Problems</li> </ol> <p><b>Unit : 2: Python for Machine Learning</b></p> <ol style="list-style-type: none"> <li>2.1 Python Environment Set-up</li> <li>2.2 Python variables and Data Types</li> <li>2.3 Python syntax</li> <li>2.4 Python Operators - Comparison, Logical and Identity</li> <li>2.5 Python Conditional statements</li> <li>2.6 Python Functions</li> <li>2.7 Python Sequences</li> <li>2.8 Lists, Tuples, Dictionaries</li> <li>2.9 Python Iterations</li> <li>2.10 Python Object Oriented Programming</li> <li>2.11 Python Math Operations - Matrix, Scalars and Vectors, Arrays in Python, Addition and Subtraction of matrices, Dot Product of matrices</li> </ol> <p><b>Unit : 3: Working with Python Libraries</b></p> <ol style="list-style-type: none"> <li>3.1 Numpy</li> <li>3.2 Pandas</li> <li>3.3 Scipy</li> <li>3.4 Scikit-learn</li> <li>3.5 TensorFlow</li> <li>3.6 Keras</li> <li>3.7 PyTorch</li> <li>3.8 Matplotlib</li> </ol> <p><b>Unit : 4: Machine Learning Models</b></p> <ol style="list-style-type: none"> <li>4.1 Data set Preparation and introduction to MNIST Data set</li> <li>4.2 Data set Pre-processing</li> <li>4.3 Supervised ML</li> <li>4.4 k-Nearest Neighbor - k-NN Concept and Intuition, Effect of k</li> <li>4.5 Naïve Bayes and Bayes Classifier</li> <li>4.6 Multiclass Classification</li> <li>4.7 Unsupervised ML - Dimensionality Reduction- PCA, K-means Clustering</li> <li>4.8 Introduction to Reinforcement Learning</li> <li>4.9 Artificial Neural Network</li> </ol> <p><b>Unit : 5: Regression Techniques and Advanced ML</b></p> <ol style="list-style-type: none"> <li>5.1 Linear</li> <li>5.2 Polynomial</li> </ol>

	5.3 Logistic 5.4 Cross Validation 5.5 Introduction to Deep Learning  <b>Case Study</b> – Object Classification and Recognition
Reference Book	<ol style="list-style-type: none"> <li>1. Machine Learning using Python by U Dinesh Kumar and Manaranjan Pradhan, Wiley, 2019</li> <li>2. Machine Learning For Absolute Beginners: A Plain English Introduction, by Oliver Theobald 2nd Edition Scatterplot Press, 2017</li> <li>3. Machine Learning: The New AI (The MIT Press Essential Knowledge Series), By Ethem Alpaydin, MIT Press, 2016</li> <li>4. Python Machine Learning by Sebastian Raschka, Packt, 2015</li> <li>5. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili, Packt, 2017</li> <li>6. Fundamentals of Deep Learning by Nikhil Buduma, O’Reilly, 2017</li> </ol>
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : IT 903 : Cloud Computing

Course Code	903
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	<p><b>Unit : 1: Introduction to Cloud Computing</b></p> <ul style="list-style-type: none"> <li>1.1 Characteristics of Cloud Computing</li> <li>1.2 Cloud Service Models - Infrastructure as a Service, Platform as a Service, Software as a Service and Anything as a Service</li> <li>1.3 Cloud Deployment Models - Private Cloud, Community Cloud, Public Cloud and Hybrid Cloud</li> <li>1.4 Difference Between Traditional Computing and Cloud Computing</li> <li>1.5 Virtualization <ul style="list-style-type: none"> <li>1.5.1 Need of Virtualization</li> <li>1.5.2 Types of Virtualization</li> <li>1.5.3 Virtualization in Cloud Computing</li> </ul> </li> <li>1.6 Containerization <ul style="list-style-type: none"> <li>1.6.1 Concept of Containerization</li> <li>1.6.2 Need of Containerization</li> <li>1.6.3 Containerization and Virtualization</li> </ul> </li> </ul> <p><b>Unit : 2: Cloud Infrastructure and Architectures</b></p> <ul style="list-style-type: none"> <li>2.1 Cloud Computing Stack <ul style="list-style-type: none"> <li>2.1.1 Composability</li> <li>2.1.2 Infrastructure</li> <li>2.1.3 Platforms</li> <li>2.1.4 Virtual Applications</li> <li>2.1.5 Communication Protocols</li> <li>2.1.6 Applications</li> </ul> </li> <li>2.2 Cloud Data Center Architecture</li> <li>2.3 Conceptual View of Networking in Cloud Computing</li> <li>2.4 Cloud Data Storage (Overview of SAN, DFS, etc.)</li> <li>2.5 Computing Cluster in Cloud</li> <li>2.6 Service Level Agreement and Cloud Pricing Model</li> <li>2.7 Cloud Security Concepts</li> <li>2.8 QoS Measurement in Cloud</li> <li>2.9 Inter Cloud Communication</li> </ul> <p><b>Unit : 3: Service Offerings by Cloud Providers</b></p> <ul style="list-style-type: none"> <li>3.1 Introduction to Amazon Cloud Services <ul style="list-style-type: none"> <li>3.1.1 EC2 – Elastic Cloud Compute</li> <li>3.1.2 Elastic Container Service</li> <li>3.1.3 Elastic Kubernetes Service</li> <li>3.1.4 Lambda – Serverless Computing</li> <li>3.1.5 VPC – Virtual Private Cloud</li> <li>3.1.6 S3 – Simple Storage Service</li> <li>3.1.7 EBS – Elastic Block Storage</li> <li>3.1.8 RDS – Relational Database Service</li> <li>3.1.9 DynamoDB</li> <li>3.1.10 Cloud9</li> </ul> </li> </ul>

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	<ol style="list-style-type: none"> <li>1. Cloud Computing and Virtualization by Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee, WILEY, 2018</li> <li>2. Cloud Computing : A Practical Approach by Anthony Velte, Toby Velte, Robert Elsenpeter, Mc Graw Hill, 2017</li> <li>3. Cloud Computing – Black Book by Kailash Jayaswal, Jagannath kallakurchi, Donald Houde, Deven Shah, Dreamtech Press, 2014</li> <li>4. Architecting The Cloud by Michael Kavis, WILEY, 2014</li> <li>5. Learning AWS by Aurobindo Sarkar, Amit Shah, Packt Publication, 2015</li> <li>6. Google Cloud Platform Cookbook by LegorieRajan, Packt Publication, 2018</li> <li>7. Building Your Next Big Thing with Google Cloud Platform by S.P.T. Krishnan, Jose L. Ugia Gonzalez, Apress, 2015</li> <li>8. Microsoft Azure Fundamentals by Jim Cheshire, Pearson, 2019</li> <li>9. Microservice Architecture: Aligning Principles, Practices, and Culture by Mike Amundsen, Ronnie Mitra, SPD publications, 2016</li> <li>10. Building Microservices Paperbackby Sam Newman, SPD Press, 2017</li> <li>11. Microservices for Java EE Architects: Addendum for The Java EE Architect's Handbook by Derek C. Ashmore, 2017</li> <li>12. Kubernetes Microservices with Docker by Deepak Vohra,Apress Publication, 2018</li> <li>13. Docker Quick Start Guide: Learn Docker like a boss, and finally own your applications by Earl Waud, PACKT publications, 2018</li> <li>14. Apache ZooKeeper Essentials by Saurav Haloi, PACKT publications, 2015</li> <li>15. Hazelcast A Complete Guide - 2019 Edition by Gerardus Blokdyk publication: 5STARCOOKS, 2019</li> <li>16. Microservices Patterns: With examples in Java by Chris Richardson, Publisher: Manning Publications, 2018</li> <li>17. Microservices and Containers 1st Edition by Parminder Singh, Kocher Publisher - Addison-Wesley Professional, 2018</li> <li>18. Hands-On Microservices with Kubernetes: Build, deploy, and manage scalable microservices on Kubernetes, by Gigi Sayfan, Packt Publications</li> </ol>
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

## Course: IT 904: Business Intelligence

Course Code	904
Course Title	Business Intelligence
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 provide practical knowledge of Business Intelligence.
Course Objective	To impart theoretical and practical knowledge of Data Warehouse, Data Mining and Data Visualization.
Pre-requisite	RDBMS
Course Out come	Student will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization.
Course Content	<p><b>Unit: 1 : Introduction to Data Warehouse</b></p> <ol style="list-style-type: none"> <li>1.1 The Need for Data Warehousing</li> <li>1.2 Increasing Demand for Strategic Information</li> <li>1.3 Inability of Past Decision Support System</li> <li>1.4 OLTP Vs OLAP</li> <li>1.5 Data Warehouse Components</li> <li>1.6 Benefits of Data Warehousing</li> <li>1.7 Features of a Data Warehouse</li> <li>1.8 The Information Flow Mechanism</li> <li>1.9 Role of Metadata</li> <li>1.10 Classification of Metadata</li> <li>1.11 Data Warehouse Architecture</li> <li>1.12 Different Types of Architecture</li> <li>1.13 Data Warehouse and Data Marts</li> <li>1.14 Application of DW</li> </ol> <p><b>Unit : 2: ETL ( Extraction Transformation and Loading)usingSSIS</b></p> <ol style="list-style-type: none"> <li>2.1 Extraction using SSIS <ol style="list-style-type: none"> <li>2.1.1 Connection manager</li> <li>2.1.2 OLEDB CM</li> <li>2.1.3 ADO CM</li> <li>2.1.4 ADO.NET CM</li> <li>2.1.5 Cache CM</li> <li>2.1.6 Excel CM</li> <li>2.1.7 File CM</li> <li>2.1.8 FTP and SFTP</li> <li>2.1.9 SMO</li> </ol> </li> <li>2.2 SSIS Sources <ol style="list-style-type: none"> <li>2.2.1 Source Assistant</li> <li>2.2.2 ADO.NET</li> <li>2.2.3 OLEDB</li> <li>2.2.4 ADO.NET source</li> <li>2.2.5 Excel Source</li> <li>2.2.6 OLEDB Source</li> <li>2.2.7 Flat file source</li> </ol> </li> <li>2.3 SSIS Destination <ol style="list-style-type: none"> <li>2.3.1 ADO</li> <li>2.3.2 OLEDB</li> <li>2.3.3 Flat file</li> </ol> </li> <li>2.4 Containers <ol style="list-style-type: none"> <li>2.4.1 For loop containers</li> <li>2.4.2 ForEach loop containers</li> <li>2.4.3 File Enumerator</li> <li>2.4.4 NodeList Enumerator</li> </ol> </li> </ol>

- 2.4.5 SMO enumerator
- 2.4.6 Variable enumerator

**Unit : 3: Transformations using SSIS**

- 3.1 Copy Column Transformation
- 3.2 Data Conversion Transformation
- 3.3 Control flow
- 3.4 Data flow
- 3.5 Derived column transformation
- 3.6 Sort transformation
- 3.7 Union all transformation
- 3.8 Merge transformation
- 3.9 Aggregate transformation
- 3.10 Export column transformation
- 3.11 Multicast and merge join
- 3.12 Import Column transformation
- 3.13 Lookup
- 3.14 Event handlers
- 3.15 Merge Join transformation
  - 3.15.1 Inner Join
  - 3.15.2 Left outer Join
  - 3.15.3 Right Outer Join
  - 3.15.4 Full Outer Join
- 3.16 Multicast Transformation
- 3.17 Delete, Update operations
- 3.18 Union all transformation
- 3.19 Script task, KRA weight

**Unit : 4: Dimensional Modeling using SSAS**

- 4.1 Fact Tables, Fact less Fact Table and Dimension Tables
- 4.2 Star Schema
- 4.3 Snowflake schema
- 4.4 Updates to dimensions
- 4.5 Slowly changing, rapidly changing dimensions and large dimensions
- 4.6 Keys
- 4.7 Types of models
- 4.8 Creating tabular model
- 4.9 Creating relationships
- 4.10 Creating calculated column
- 4.11 Create measures
- 4.12 Key Performance Indicators (KPI)
- 4.13 Perspectives
- 4.14 Hierarchies
- 4.15 Partitions
- 4.16 Deployment
- 4.17 DirectQuery mode
- 4.18 Creating Multidimensional model
- 4.19 Aggregate fact tables
- 4.20 Attribute relationships
- 4.21 Adding and removing measures
- 4.22 Working with calculations
- 4.23 Named Query and Named Calculations
- 4.24 Working with KPI
- 4.25 Create and run MDX (SSDT)
- 4.26 Different storage models - ROLAP , MOLAP and HOLAP
- 4.27 Deployment in SSIS
- 4.28 Error log

**Unit : 5 : Visualizations ( Using SSRS, Power BI) and Advanced topics**

- 5.1 Query
- 5.2 Models

	<ul style="list-style-type: none"> <li>5.3 View</li> <li>5.4 Creating Measures and quick measures</li> <li>5.5 Creating Visualization</li> <li>5.6 Embedding power BI reports</li> <li>5.7 SSRS <ul style="list-style-type: none"> <li>5.7.1 Creating reports</li> <li>5.7.2 Working with Tablix</li> <li>5.7.3 Working with parameter</li> <li>5.7.4 Paginated BI Reports</li> <li>5.7.5 Sub-Reports</li> <li>5.7.6 Deployment</li> </ul> </li> <li>5.8 Advance topics <ul style="list-style-type: none"> <li>5.8.1 Azure DW</li> <li>5.8.2 Data Lake</li> <li>5.8.3 Data mining using SSAS</li> <li>5.8.4 Classification</li> <li>5.8.5 Association</li> <li>5.8.6 Clustering</li> </ul> </li> </ul>
Reference Book	<ol style="list-style-type: none"> <li>1. "The Data Warehouse Toolkit", Second Edition, Kimball, et al. , John Wiley &amp; Sons; ISBN: 9814-12-614-4, Oct 2004</li> <li>2. "Data Warehousing in the Real World", Sam Anahory and Dennis Murray, Pearson Education, ISBN – 81-317-0459-9 , 2007</li> <li>3. "Microsoft SQL Server 2008 Integration Services", Kirk Haselden, Pearson ,ISBN- 978- 81- 317- 3477-3, 2011</li> <li>4. "Data Warehouse Fundamentals", Paulraj Ponniah, Wiley India Edition, ISBN- 81-265-0919-8,2006</li> <li>5. Microsoft SQL Server 2012 Integration Services: An Expert Cookbook, Reza Rad, Pedro Perfeito, Packt, May 23, 2012, ISBN: 9781849685245</li> <li>6. Developing SSRS Reports for Dynamics AX, Mukesh Hirwani, Packt, September 24, 2013, ISBN: 9781782177746</li> <li>7. MDX with SSAS 2012 Cookbook, Tomislav Piasevoli, Sherry Li, August 25, 2013, Packt , ISBN: 9781849689601</li> <li>8. Expert Cube Development with SSAS Multidimensional Models, Alberto Ferrari, Chris Webb, Et al, February 21, 2014, Packt, ISBN: 9781849689908</li> </ol>
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	<ul style="list-style-type: none"> <li>30% Internal assessment</li> <li>70% External assessment</li> </ul>

Course : IT 905 : Practical 19

Course Code	905
Course Title	Practical 19
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 IoT and Machine Learning algorithms.
Course Objective	The objective of the course is to impart knowledge of implementation of IoT and Machine Learning algorithm.
Prerequisite	Basics concepts of Embedded system, applied mathematics and statistics.
Course Outcome	After completion of this course, students will be able to develop IoT based applications and implement Machine Learning algorithms.
Course Content	Practical based on Paper No. 901 – Internet of Things and 902 – Machine learning using Python
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course:IT 906: Practical 20

Course Code	906
Course Title	Practical20
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 this course is to provide practical knowledge of Business Intelligence and application development using Micro Services Architecture.
Course Objective	The objective of the course is to impart practical knowledge of Data Warehouse, Data Mining, Data Visualization and application development using Micro Services Architecture.
Prerequisite	Basic concepts of RDBMS and Programming
Course Outcome	Student will be able to perform ETL from any data source, create multidimensional cube or tabular data, perform data mining and data visualization using latest Microsoft tools and technologies. Furthermore, students will be able to develop applications using Micro Services Architecture.
Course Content	Practical based on Paper No. 903 – Cloud Computing (Unit 4 : Micro Services Architecture) and 904 – Business Intelligence
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course : IT 907 : Part Time Project 3

Course Code	907
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 / BI / 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 / BI / 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 / BI / Cloud technologies.
Course Content	<p>The students are required to develop project using Mobile / MEAN stack / IoT / BI / Cloud technologies.</p> <p>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.</p> <p>The students have to submit the following reports at the institution:</p> <ol style="list-style-type: none"> <li>1. Project Joining Report</li> <li>2. Project Title Report</li> <li>3. Progress Report</li> <li>4. Project Completion Certificate</li> <li>5. Institution Certificate</li> <li>6. Non-disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)</li> </ol> <p>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.</p>
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

### Course : IT 1001 : Project

Course Code	1001
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 IT professional.
Course Content	<p>The students are required to do 6 months full time project preferably in industry.</p> <p>The students must prepare documentation of the project completed as per the Software Engineering Guidelines.</p> <p>At the end of the semester, the students have to submit their project report in bounded form to the institution.</p> <p>The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.</p> <p>The students have to submit the following reports at the institution:</p> <ol style="list-style-type: none"> <li>1. Project Joining Report</li> <li>2. Project Title Report</li> <li>3. Progress Report</li> <li>4. Project Completion Certificate</li> <li>5. Institution Certificate</li> <li>6. Non-disclosure of Source Code Certificate (In case the student is unable to demonstrate project source code)</li> </ol> <p>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.</p>
Reference Books	NIL
Teaching Methodology	Project guidance, Review
Evaluation Method	30% Internal Assessment 70% External Assessment

## Master of Science (Information Technology)

Name of Program		Master of Science (Information Technology)						
Abbreviation		M.Sc. (I.T.)						
Duration		5 Years Integrated Course B.Sc.(I. T.) – 3 years – Semester 1 to 6 M.Sc.( I. T.) – 2 years – Semester 7 to 10						
Eligibility		H S C / Equivalent Examination from Science Stream ( A / B / AB Group) or Vocational Stream or General Stream (Commerce) with English as one of the subject.						
Objective of Program		The objective of the program is to transform students into professionals by indoctrinating advanced technical knowledge, enhancing technical skills, communication skills and provide outstanding placement in reputed I.T. companies.						
Program Outcome		After the completion of the course, students will be able to develop and manage various types of software based on technologies learnt throughout the course and emerging technologies in IT industry which will give them excellent career prospects.						
Effective From		June 2020						
<b>Program Structure</b>		<b>M.Sc. (I.T.) – Semester 9 (M.Sc. (I.T.) 5 years Integrated Course)</b>						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
901	Internet of Things	4	0	4	3 Hrs	70	30	100
902	Machine Learning using Python	4	0	4	3 Hrs	70	30	100
903	Cloud Computing	4	0	4	3 Hrs	70	30	100
904	Business Intelligence	4	0	4	3 Hrs	70	30	100
905	Practical 19	-	3	3	2 Hrs	70	30	100
906	Practical 20	-	3	3	2 Hrs	70	30	100
907	Part Time Project 3	-	3	3	-	70	30	100
	<b>Total</b>	<b>16</b>	<b>9</b>	<b>25</b>	<b>-</b>	<b>490</b>	<b>210</b>	<b>700</b>
<b>Program Structure</b>		<b>M.Sc. (I.T.) – Semester 10 (M.Sc. (I.T.) 5 years Integrated Course)</b>						
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
1001	Project	-	-	25	-	490	210	700
	<b>Total</b>			<b>25</b>	<b>-</b>	<b>490</b>	<b>210</b>	<b>700</b>
<b>Program Passing Rules</b>		<b>As per University rules</b>						