GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME:M. E Computer Engineering
SUBJECT NAME:Data Storage Technologies and Networks
SUBJECT CODE: 3715606
ME 1st Semester

Type of course: Elective

Prerequisite: Basic knowledge of Computer Architecture, Operating Systems, and Computer Networking is required.

Rationale: This subject will provide learners with a basic understanding of Enterprise Data Storage and Management Technologies.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No	Content	Total Hrs	% Weightage
1	**Data storage fundamentals:** Storage Media and Technologies; Magnetic, Optical and Semiconductor Media, Techniques for read/write Operations, Issues and Limitations, Introduction to IT Infrastructure Components, Server-Storage Connectivity, Virtualization technologies.	8	17%
2	**Usage and Access:** Positioning in the Memory Hierarchy, Hardware and Software Design for Access, Performance issues.	8	17%
3	**Large Storages:** Hard Disks, Networked Attached Storage, Scalability issues, Networking issues.	7	15%
4	**Storage Architecture:** Introduction to Storage System Architecture, Storage Partitioning, Storage System Design, Caching, Legacy Systems.	9	19%
5	**Storage Area Networks:** Hardware and Software Components, Storage Clusters/Grids, Network attached storage. **Storage QoS:** Performance, Reliability, and Security issues.	9	19%
6	**Storage Infrastructure Management, Cloud Computing, and Trends in Storage Industry:** Introduction to Storage Management Processes, Cloud Computing and Cloud Storage, and an overview of the technology trends in the Storage Industry, Recent Trends related to Copy data management, Erasure coding, and Software defined storage appliances.	7	15%
	Total	**48**	**100%**

Reference Books:

1) The Complete Guide to Data Storage Technologies for Network-centric Computing Paperback– Import, Mar 1998 by Computer Technology Research Corporation.
2) Data Storage Networking: Real World Skills for the Comptia Storage+ Certification and Beyond by Nigel Poulton
3) Information Storage and Management: Storing, Managing and Protecting Digital Information, EMC Education Services, Wiley, 2010
4) Storage Networks Explained by Ulf Troppens, Wolfgang Muller-Freidt, Rainer Wolafka, Wiley Publisher

Course Outcome:

After learning the course the students should be able to:

- Learn Storage System Architecture
- Overview of Virtualization Technologies, Storage Area Network

Practical List:

1) Write a program to read and write in raw format from image file.

2) Configure MongoDB to restrict the access of database on network.
3) **Structure of 'restaurants' collection:**


```
{
 "address": {
    "building": "1007",
    "coord": [ -73.856077, 40.848447 ],
    "street": "Morris Park Ave",
    "zipcode": "10462"
 },
 "borough": "Bronx",
 "cuisine": "Bakery",
 "grades": [
    { "date": { "$date": 1393804800000 }, "grade": "A", "score": 2 },
    { "date": { "$date": 1378857600000 }, "grade": "A", "score": 6 },
    { "date": { "$date": 1358985600000 }, "grade": "A", "score": 10 },
    { "date": { "$date": 1322006400000 }, "grade": "A", "score": 9 },
    { "date": { "$date": 1299715200000 }, "grade": "B", "score": 14 }
 ],
 "name": "Morris Park Bake Shop",
 "restaurant_id": "30075445"
}
```


a) Write a MongoDB query to display all the documents in the collection restaurants.
b) Write a MongoDB query to display the fields restaurant_id, name, borough and cuisine for all the documents in the collection restaurant.
c) Write a MongoDB query to display all the restaurant which is in the borough Bronx.
d) Write a MongoDB query to display the next 5 restaurants after skipping first 5 which are in the borough Bronx.
e) Write a MongoDB query to find the restaurants that achieved a score, more than 80 but less than 100.
f) Write a MongoDB query to find the restaurants which locate in latitude value less than -95.754168.

g) Write a MongoDB query to find the restaurants that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168.

h) Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Wil' as first three letters for its name.

i) Write a MongoDB query to find the restaurants which belong to the borough Bronx and prepared either American or Chinese dish.

j) Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which prepared dish except 'American' and 'Chinese' or restaurant's name begins with letter 'Wil'.

k) Write a MongoDB query to find the restaurant Id, name and grades for those restaurants where the 2nd element of grades array contains a grade of "A" and score 9 on an ISODate "2014-08-11T00:00:00Z".

l) Write a MongoDB query to find the restaurant name, borough, longitude and latitude and cuisine for those restaurants which contain 'Mad' as first three letters of its name.

4) Solve the Storage Location Allocation Problem to reduce the overall required warehouse space- to efficiently allocate produced goods-and to minimize the internal material handling times.

5) Implement a service to store and retrieve objects (BLOB) over public cloud like platforms like Amazon S3 or Azure Storage.

6) Implement a client side encryption mechanism to protect data on public cloud like Amazon or Azure.

7) Build a simple static website and host it on S3.

List of Open Source Software/learning website:

1) https://www.edx.org/course/introduction-data-storage-management-ieeex-storage101x-0