

DATA MINING AND DATA WARE HOUSING		SEMESTER	VI
Course Code	BBCA601	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduction to general issues of Data Warehouse and Data Mining. • Understanding of the different architectures and mining techniques • The role and functions of Data Warehouse and Data Mining • Explain the stages and process different data mining techniques. • Learn mining and warehouse techniques through the use of different tools. 			
MODULE-1			
<p>Data Warehouse: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, ExtractionTransformation-Loading, Logical (Multi- Dimensional), Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact Less-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP. Textbook 2: Chapter 4.1,4.2</p>			
			Number of Hours: 10
MODULE-2			
<p>Introduction to Data Mining: Introduction, what is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of similarity and Dissimilarity-Basics. Textbook 2: Chapter 4.4 Textbook 1: Chapter 1.1,1.2,1.4, 2.1 to 2.4</p>			
			Number of Hours: 10
MODULE-3			
<p>Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FPGrowth Algorithm, Evaluation of Association Patterns. Textbook 1: Chapter 6.1,6.2,6.3, 6.5, 6.6 and 6.7</p>			
			Number of Hours: 10
MODULE-4			
<p>Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers. Textbook 1: Chapter 4.3,4.6,5.1,5.2,5.3</p>			
			Number of Hours: 10
MODULE-5			
<p>Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms. Textbook 1: Chapter 8.1 to 8.5, 9.3 to 9.5</p>			
			Number of Hours: 10
Teaching Methodology: Chalk and talk method / PowerPoint Presentation			
COURSE OUTCOMES:			
CO 1. Understand warehousing architectures and tools for systematically organizing large database			

and use their data to make strategic decisions.

CO 2. Apply KDD process for finding interesting pattern from warehouse.

CO 3. Analyze the kinds of patterns that can be discovered by association rule mining.

CO 4. Evaluate interesting patterns from large amounts of data to analyze for predictions and classification.

CO 5. Design select suitable methods for data mining and analysis.

Suggested Learning Resources:

Books:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
2. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.

Web links:

- <https://nptel.ac.in/courses/106105174>
- https://onlinecourses.swayam2.ac.in/e-learning/preview/imb25_mg200

CYBER SECURITY		SEMESTER	VI
Course Code	BBCA602A	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce the fundamentals and classifications of cybercrime and information security. • Familiarize students with cyber offenses, attack methods, and mobile security issues. • Provide knowledge of tools and techniques used in cybercrimes and cyber attacks. • Develop understanding of computer forensics and digital evidence investigation. • Explain cyber laws, ethical issues, and cybersecurity challenges in the modern world. 			
MODULE-1			
<p>Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Who are Cybercriminals?, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes. Textbook 1: Chapter 1</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-2			
<p>Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing. Mobile and Wireless Devices: Credit Card Frauds in Mobile and Wireless Computing Era, Attacks on Mobile/Cell Phones. Textbook 1: Chapter 2, 3</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-3			
<p>Tools and Methods Used in Cyberline: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft) Textbook 1: Chapter 4, 5</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-4			
<p>Understanding Computer Forensics: Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites: The Security/Privacy Threats, Forensics Auditing, Anti Forensics. Textbook 1: Chapter 7</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-5			
<p>Cybercrimes and Cybersecurity-The Legal Perspectives: Why do we need Cyberlaw, The Indian Context, The Indian IT Act, the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario. Cybercrime and Cyberterrorism-Social, Political, Ethical and Psychological Dimensions: Intellectual Property in the Cyberspace, The Ethical Dimension of Cybercrimes, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Ethical Hackers. Textbook 1: Chapter 6, 10</p> <p style="text-align: right;">Number of Hours: 10</p>			

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

- CO 1.** Explain the concept, evolution, and classification of cybercrime along with its global and Indian perspectives.
- CO 2.** Analyze various cyber offenses, attack strategies, and security threats in mobile and wireless environments.
- CO 3.** Identify and evaluate different tools, techniques, and attack methods used in cybercrimes and cybersecurity breaches.
- CO 4.** Apply principles of digital forensics to investigate cyber incidents and understand evidence handling procedures.
- CO 5.** Interpret cyber laws, legal frameworks, and ethical considerations related to cybercrime and cybersecurity.

Suggested Learning Resources:

Books:

1. Nina Godbole, SunitBelapure, Cyber Security, Wiley India, New Delhi
2. Marjie T. Britz, Computer Forensics and Cyber Crime An Introduction, Pearson publication

Web links:

- <https://nptel.ac.in/courses/106106248>
- <https://www.youtube.com/playlist?list=PLf8YqCm9HoI6fb4LdoY2tFgIfM0PrgInS>
- https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_lw01

CRYPTOGRAPHY AND NETWORK SECURITY		SEMESTER	VI
Course Code	BBCA602B	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce the fundamentals of cybersecurity and cryptographic techniques. • Familiarize students with mathematical foundations used in cryptography. • Provide knowledge of secret key and public key cryptographic systems. • Develop understanding of authentication, key management, and digital certificates. • Explain network and transport layer security mechanisms such as IPSec and SSL. 			
MODULE-1			
<p>Introduction - Cyber Attacks, Defence Strategies and Techniques, Guiding Principles Mathematical Background for Cryptography: Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem. Basics of Cryptography: Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties. Textbook 1: Chapter 1, 3, 4</p>			
			Number of Hours: 10
MODULE-2			
<p>Secret Key Cryptography: Product Ciphers, DES Construction. Public Key Cryptography and RSA: RSA Operations, Why Does RSA Work?, Performance, Applications, Public Key Cryptography Standard (PKCS). Textbook 1: Chapter 5, 6</p>			
			Number of Hours: 10
MODULE-3			
<p>Cryptographic Hash: Introduction, Properties, Construction, Applications and Performance, The Birthday Attack. Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications. Textbook 1: Chapter 7, 8</p>			
			Number of Hours: 10
MODULE-4			
<p>Key Management: Introduction, Digital Certificates, Public Key Infrastructure, Identity-based Encryption Authentication-I: One way Authentication, Mutual Authentication, Dictionary Attacks Authentication - II: Centralised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics. Textbook 1: Chapter 10, 11, 12</p>			
			Number of Hours: 10
MODULE-5			
<p>IPSec Security at the Network Layer: Security at Different layers: Pros and Cons, IPSec in Action, Internet Key Exchange (IKE) Protocol, Security Policy and IPSEC Virtual Private Networks. Security at the Transport Layer: Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, OpenSSL. Textbook 1: Chapter 13, 14</p>			
			Number of Hours: 10
Teaching Methodology: Chalk and talk method / PowerPoint Presentation			

COURSE OUTCOMES:

- CO 1.** Explain cyber defense strategies and basic cryptographic concepts.
- CO 2.** Apply secret key and public key cryptographic algorithms for secure communication.
- CO 3.** Analyze cryptographic hash functions and discrete logarithm applications.
- CO 4.** Illustrate authentication mechanisms, key management, and public key infrastructure.
- CO 5.** Evaluate network and transport layer security protocols including IPSec and SSL.

Suggested Learning Resources:**Books:**

1. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition

Web links:

- <https://nptel.ac.in/courses/106105162>
- <https://nptel.ac.in/courses/106105031>
- <https://www.youtube.com/watch?v=FwIa-GSn32I>

Computer Graphics with OpenGL		SEMESTER	VI
Course Code	BBCA602C	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce the fundamentals of computer graphics and OpenGL programming. • Familiarize students with graphics display systems, drawing algorithms, and geometric transformations. • Provide knowledge of clipping, color models, illumination, and 3D transformations. • Develop understanding of 3D viewing and visible surface detection techniques. • Explain interactive graphics, animation, curves, and surface modeling concepts. 			
MODULE-1			
<p>Overview: Computer Graphics and OpenGL: Computer Graphics:Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, color CRT monitors, Flat panel displays. Raster-scan systems: video controller, raster scan Display processor, graphics workstations and viewing systems, Input devices, graphics networks, graphics on the internet, graphics software. OpenGL: Introduction to OpenGL ,coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham's), circle generation algorithms(Bresenham's).</p> <p>Textbook 1: Chapter -1: 1-1 to 1-9,2-1 to 2-9 (Excluding 2-5),3-1 to 3-5,3-9,3-20.</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-2			
<p>Fill area Primitives, 2D Geometric Transformations and 2D viewing: Fill area Primitives: Polygon fill-areas, OpenGL polygon fill area functions, fill area attributes, general scan line polygon fill algorithm, OpenGL fill-area attribute functions. 2DGeometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 2D viewing: 2D viewing pipeline, OpenGL 2D viewing functions.</p> <p>Textbook 1: Chapter 3-14 to 3-16,4-9,4-10,4-14,5-1 to 5-7,5-17,6-1,6-4</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-3			
<p>Clipping,3D Geometric Transformations, Color and Illumination Models: Clipping: clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations, OpenGL geometric transformations functions. Color Models: Properties of light, color models, RGB and CMY color models. Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model, Corresponding openGL functions.</p> <p>Textbook 1: Chapter :6-2 to 6-08 (Excluding 6-4),5-9 to 5-17(Excluding 5-15),12-1,12-2,12-4,12-6,10-1,10-3</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-4			
<p>3D Viewing and Visible Surface Detection: 3DViewing:3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters , Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D</p>			

screen coordinates. OpenGL 3D viewing functions. Visible Surface Detection Methods: Classification of visible surface Detection algorithms, back face detection, depth buffer method and OpenGL visibility detection functions.

Textbook 1: Chapter: 7-1 to 7-10(Excluding 7-7), 9-1 to 9-3, 9-14

Number of Hours: 10

MODULE-5

Input& interaction, Curves and Computer Animation: Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modelling, Programming Event Driven Input, Menus Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations .Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions. Corresponding openGL functions.

Textbook 1:Chapter :8-3 to 8-6 (Excluding 8-5),8-9,8-10,8-11,3-8,8-18,13-11,3-2,13-3,13-4,13-10

Textbook 2:Chapter 3: 3-1 to 3.11: Input& interaction

Number of Hours: 10

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

C01. Explain computer graphics systems, display devices, and OpenGL basics.

C02. Apply 2D transformations, polygon filling, and viewing techniques in graphics applications.

C03. Analyze clipping algorithms, color models, illumination, and 3D transformations.

C04. Implement 3D viewing and visible surface detection methods using OpenGL.

C05. Develop interactive graphics and animation applications using curves and surface modeling techniques.

Suggested Learning Resources:

Books:

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,4th Edition, Pearson Education, 2011.
2. Edward Angel: Interactive Computer Graphics- A Top-Down approach with OpenGL, 5th edition, Pearson Education, 2008.

Web Links:

1. <https://nptel.ac.in/courses/106/106/106106090/>
2. <https://www.youtube.com/watch?v=XYWjnRV3ty8>
3. <http://www.opengl-redbook.com/>
4. www.opengl.org

WIRELESS COMMUNICATION		SEMESTER	VI
Course Code	BBCA603A	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce the fundamentals of cellular and wireless communication systems. • Familiarize students with wireless channel modeling and propagation mechanisms. • Provide knowledge of fading, diversity, and channel characteristics in wireless systems. • Develop understanding of multiple access techniques such as CDMA and OFDM. • Explain advanced wireless concepts including MIMO systems and beamforming. 			
MODULE-1			
<p>Evolution of Cellular Systems and Mobile Communication: Wireless Network generations, Basic propagation Mechanisms. Principles of Cellular Communications: Cellular terminology, Cell structure and Cluster, Frequency reuse concept, Cluster size and system capacity, Frequency Reuse Distance, Cochannel Interference and signal quality. Textbook 2: 1.4, 2.4, 4.1 to 4.4, 4.6, 4.7</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-2			
<p>Principles of Wireless Communications: The Wireless Communication Environment, Modelling of Wireless Systems, System Model for Narrowband Signals, Rayleigh Fading Wireless Channel, Channel Estimation in Wireless Systems, Diversity in wireless systems, Multiple Receive Antenna System Model, Symbol Detection in Multiple Antenna Systems. Textbook 1 – 3.1 to 3.4, 3.7, to 3.10</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-3			
<p>The Wireless Channel: Basics of Wireless Channel Modelling, Average Delay Spread in Outdoor Cellular Channels, Coherence BW in Wireless Communications, Relation between ISI & Coherence BW, Doppler Fading in Wireless Systems, Doppler impact on a Wireless Channel, Coherence Time of the Wireless Channel, Jakes Model for Wireless Channel Correlation, Implications of Coherence Time. Textbook 1 – Chapter 4</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-4			
<p>Code Division for Multiple Access (CDMA): Basic CDMA Mechanism, Fundamentals of CDMA codes, Spreading Codes based on PN sequences, Correlation Properties of Random CDMA Spreading Sequences, Advantages of CDMA. Orthogonal Frequency Division Multiplexing (OFDM): Introduction, Motivation and Multicarrier basics, OFDM basics, OFDM Example, MIMO OFDM, OFDM Peak to Average Power ratio, SC-FDMA. Textbook 1: 5.1 to 5.5, 5.7, 7.1, 7.2, 7.3, 7.5, 7.7, 7.8</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-5			
<p>Multiple Input Multiple Output Wireless Communications: Introduction to MIMO Communications, MIMO system Model, MIMO Zero Forcing Receiver, MIMO MMSE Receiver, Singular Value decomposition of MIMO Channel, SVD and MIMO capacity, Asymptotic MIMO Capacity, Alamouti and Space-Time Codes, Nonlinear MIMO receiver: V-Blast, MIMO Beamforming. Textbook 1: 6.1 to 6.8, 6.10, 6.11</p> <p style="text-align: right;">Number of Hours: 10</p>			

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

- CO 1.** Explain the evolution of cellular systems and frequency reuse concepts.
- CO 2.** Analyze wireless channel characteristics and propagation models.
- CO 3.** Evaluate fading effects, Doppler spread, and coherence parameters in wireless systems.
- CO 4.** Compare and apply multiple access techniques such as CDMA and OFDM.
- CO 5.** Analyze and interpret MIMO system models and advanced wireless communication techniques.

Suggested Learning Resources:

Books:

1. Aditya K Jagannatham , “Principles of Modern Wireless Communication Systems: Theory and Practice” , McGraw Hill Education (India) Pvt. Ltd., 2018. Print Edition: ISBN: 978-1-25-902957-8; E-Book Edition: ISBN: 978-93-392-2003-7.
2. T L Singal, Wireless Communications, McGraw Hill Education (India) Private Limited, 2016, ISBN:0- 07-068178-3.
3. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2003
4. Pattnaik, Prasant Kumar, Mall, Rajib, “Fundamentals Of Mobile Computing”, Second Edition, PHI Learning Pvt. Ltd., 2015.
5. Dr. Ashish N.Jani, Dr. N.N. Jani , Neeta Kanabar ,” Mobile Computing - Technologies and Applications”, 2010

Web links:

- <http://www.digimat.in/nptel/courses/video/117102062/L01.html>
- https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee66
- <http://www.digimat.in/nptel/courses/video/106106167/L01.html>

BUSINESS INTELLIGENCE		SEMESTER	VI
Course Code	BBCA603B	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce business processes and the role of information technology in enterprises. • Familiarize students with digital data types, OLTP, and OLAP systems. • Provide knowledge of business intelligence concepts and decision support systems. • Develop understanding of data warehousing, data integration, and multidimensional modeling. • Explain enterprise reporting, dashboards, and performance management techniques. 			
MODULE-1			
<p>Business View of Information Technology Applications: Business Enterprise Organization, Its Functions and Core Business Process, Baldrige Business Excellence Framework, Key Purpose of Using IT in Business, The Connected World: Characteristics of Internet-ready IT Applications, Enterprise applications(ERP/CRM) and Bespoke IT applications, Information Users and Their Requirements. Types of Digital data: Getting to know Structured Data, Unstructured Data, Semi-structured Data and Difference between Semi-structured and Structured data. Textbook 1: 1.1 to 1.6, 2.1 to 2.6</p>			
			Number of Hours: 10
MODULE-2			
<p>Introduction to OLTP and OLAP: OLTP (Online Transaction Processing) OLAP (Online Analytical Processing), Different OLAP Architectures, OLTP and OLAP, Data models for OLTP and OLAP, Role of OLAP tools in the BI Architecture, OLAP operations on multidimensional data. Business Intelligence: Using Analytical Information of Decision Support, Information sources before dawn of BI, BI defined, Evolution of BI and Role of DSS, EIS, MIS and Digital Dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to Business Analytics. Textbook 1: 3.1 to 3.6, 4.1 to 4.8</p>			
			Number of Hours: 10
MODULE-3			
<p>BI Definitions and Concepts: BI Component Framework, BI Users, Business Intelligence Applications, BI Roles and Responsibilities. Basics of Data Integration: Need for Data Warehouse, Definition of Data Warehouse, Ralph Kimball's Approach vs Inmon's Approach, Goals of Data Warehouse, Constituents of Data Warehouse, Data Integration, Data Integration Technologies, Data Quality, Data Profiling. Textbook 1: 5.1 to 5.5, 6.1 to 6.12</p>			
			Number of Hours: 10
MODULE-4			
<p>Multidimensional Data Modeling: Data Modeling Basics, Types of Data Model, Data Modeling Techniques, Fact Table, Dimension Table, Typical Dimensional Models and Dimensional Modeling Life Cycle. Measures, Metrics, KPIs, and Performance Management: Understanding Measures and Performance, Measurement System Terminology, Navigating a Business Enterprise Textbook 1: 7.1 to 7.8, 8.1 to 8.3</p>			
			Number of Hours: 10
MODULE-5			
<p>Basics of Enterprise Reporting: Reporting perspectives common to all levels of Enterprise, Report Standardization and Presentation Practices, Enterprise Reporting Characteristics in OLAP World, Balanced Scorecard and Dashboards. Textbook 1: 9.1 to 9.5</p>			

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

- CO 1.** Explain the role of IT, enterprise applications, and types of digital data in business processes.
- CO 2.** Explain OLTP, OLAP, and business intelligence concepts for decision support.
- CO 3.** Apply data warehousing and data integration techniques for business intelligence systems.
- CO 4.** Apply multidimensional data modeling and performance metrics for business analysis.
- CO 5.** Evaluate enterprise reporting, dashboards, and performance management systems.

Suggested Learning Resources:

Books:

1. R.N. Prasad, Seema Acharya, Fundamentals of Business analytics, First Edition, 2011, Wiley-India
2. GaliShmueli, Nitin R Patel , peter C . Bruce, “ Data mining for Business Intelligence” Wiley-India, 2011.
3. Ralph Kimball ,Margy Ross, “Practical tools for Data Warehousing and Business Intelligence” , second Edition Wiley-India 2011

Web links:

- https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_cs65
- https://onlinecourses.swayam2.ac.in/e-learning/preview/imb25_mg221
- <https://www.youtube.com/watch?v=vR0SfrCdGto>

NOSQL		SEMESTER	VI
Course Code	BBCA603C	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
COURSE OBJECTIVES:			
After the successful completion of the course, the student will be able to			
<ul style="list-style-type: none"> • Introduce the fundamentals and need for NoSQL databases. • Familiarize students with aggregate, graph, and schemaless data models. • Provide knowledge of distribution, replication, and consistency models in NoSQL systems. • Develop understanding of Map-Reduce and key-value database concepts. • Explain document databases and their real-world applications. 			
MODULE-1			
<p>Introduction to NOSQL: Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL.</p> <p>Aggregate Data Models: Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.</p> <p>Textbook 1: Chapter 1, 2</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-2			
<p>Data Models: Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access</p> <p>Distribution Models: Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.</p> <p>Textbook 1: Chapter 3, 4</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-3			
<p>Consistency: Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums.</p> <p>Version Stamps: Business and System Transactions, Version Stamps on Multiple Nodes</p> <p>Textbook 1: Chapter 5, 6</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-4			
<p>Map-Reduce: Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce</p> <p>Key-Value Databases: What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets.</p> <p>Textbook 1: Chapter 7, 8</p> <p style="text-align: right;">Number of Hours: 10</p>			
MODULE-5			
<p>Document Databases: What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E- Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.</p>			

Textbook 1: Chapter 9

Number of Hours: 10

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

- CO 1.** Explain the concepts and significance of NoSQL databases and aggregate data models.
- CO 2.** Analyze different NoSQL data and distribution models.
- CO 3.** Evaluate consistency, replication, and transaction management techniques in distributed databases.
- CO 4.** Apply Map-Reduce and key-value database concepts for scalable data processing.
- CO 5.** Illustrate the features, applications, and limitations of document databases.

Suggested Learning Resources:

Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012
2. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
3. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
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