Sem	Core Courses	Hour / Week		DS Elective Courses	Hours/
		Theory	Lab		Week
	Database Management Systems	3			
	C# and DOT NET Framework	3			
	Computer Communication and	3			
III	Networks				
	LAB: DBMS		4		
	LAB: C# and DOT NET		4		
	Framework				
	Python Programming	3			
	Computer Multimedia and	3			
117	Animation				
IV	Operating Systems Concepts	3			
	LAB: Multimedia and Animation		4		
	LAB: Python programming		4		

Model Curriculum for BCA

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Model Course Content for BCA, Semesters III and IV

Semester: III

Course Title: Database Management System	Course code: 21BCA3C7L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Unit	Description	Hours
1	Database Architecture: Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	08
2	E-R Model: Entity-Relationship modeling: $E - R$ Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	08
3	Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values.	10

Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL

4Data Normalization: Anomalies in relational database design.
Decomposition. Functional dependencies. Normalization. First normal form,
Second normal form, Third normal form. Boyce-Codd normal form.07

Query Processing Transaction Management: Introduction TransactionProcessing. Single user & multiuser systems. Transactions: read & writeoperations. Need of concurrency control: The lost update problem, Dirtyread problem. Types of failures. Transaction states. Desirable properties(ACID properties) of Transactions. Concurrency Control Techniques: Locksand Time stamp Ordering. Deadlock & Starvation.

References:

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- Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
- 2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
- 3. Introduction to Database System, C J Date, Pearson, 1999.
- 4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
- Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Practicals:

CO: Student would be able to create tables, execute queries and PL/SQL programs.

- 1. Execute a single line query and group functions.
- 2. Execute DDL Commands.
- 3. Execute DML Commands
- 4. Execute DCL and TCL Commands.
- 5. Implement the Nested Queries.
- 6. Implement Join operations in SQL
- 7. Create views for a particular table
- 8. Implement Locks for a particular table
- 9. Write PL/SQL procedure for an application using exception handling.
- 10. Write PL/SQL procedure for an application using cursors.
- 11. Write a PL/SQL procedure for an application using functions
- 12. Write a PL/SQL procedure for an application using package

Course Title: C# and Dot Net Framework	Course code: 21BCA3C8L	
Total Contact Hours: 42	Course Credits: 03+02	
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours	
Summative Assessment Marks: 60		

Course Outcomes (COs):

At the end of the course, students will be able to:

- Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language.
- Interpret and Develop Interfaces for real-time applications.
- Build custom collections and generics in C#.

DSC8: C# and Dot Net Framework

Unit	Description	Hours
1	Introduction to .Net Technologies: Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies.	08
2	Introduction to C#:Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations. OOPS with C#: Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions.	08
3	Introduction to VB.NET : Introduction VB.NET -IDE – Creating a shortcut to start VB.NET. Maneuverings the Toolbar Auto-hide, Docking and Undocking, Placing and Resizing the Windows, Forms, Properties Window and Solution Explorer. Writing and Event Procedure. Execution Basic Keywords. Data Types. VB.NET statements. Conditional statements: If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays.	08
4	Application Development on .NET:C#.NET: Building Windows Applications, VB.NET: Windows Forms. Working with Controls, Timer, Picture-box, Group-box, Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Subroutines and Functions in VB.NET. Database applications	10
5	ADO .NET Connectivity: Introduction to ADO.NET, ADO vs ADO.NET. Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Programming Web Applications with Web Forms. ASP .NET applications with ADO.NET	08

References:

- 1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
- 2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
- 3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
- "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Practicals:

- 1. Develop a C# .NET console application to demonstrate the conditional statements.
- 2. Develop a C# .NET console application to demonstrate the control statements.
- 3. Develop an application in C#.NET that demonstrates the windows controls
- 4. Demonstrate Multithreaded Programming in C#.NET
- 5. Demonstrate subroutines and functions in C#.NET
- 6. Develop an application for deploying various built-in functions in VB.NET
- 7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
- 8. Construct a console application to demonstrate the OOP Concepts
- 9. Develop a web application in VB.NET for dynamic Login Processing
- 10. Develop a Windows application with database connectivity for core-banking transactions

Course Title: Computer Communication and Networks	Course code: 21BCA3C9L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

DSC9: Computer Communication and Networks

Unit	Description	Hours
1	Introduction: Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI reference model, The TCP/IP reference model.	08
2	The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.	07
3	The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, Elementary data link protocols, sliding window protocols	08
4	The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.	, 09
5	The Transport Layer and Application Layer: Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), DNS, Electronic Mailing, and World Wide Web.	10
Referen		
1. 0 2. 1	Computer Networks, Andrew S. Tanenbaum, 5 ^{ee} Edition, Pearson Education, 20 Data Communication & Networking, Behrouza A Forouzan, 3 rd Edition, Tata)10. McGraw

Hill,2001.

- 3. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
- Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
 Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
- 6. http://highered.mheducation.com/sites/0072967757/index.htmls

Skill Enhancement Course: SEC for B.Sc. & other Subject Students

Semester: III/IV

Course Title: Artificial Intelligence	Course Credits: 2
Total Contact Hours: 13 hours of theory and 26 hours of practical	Duration of ESA: 01 Hour
Formative Assessment Marks: 20 marks	Summative Assessment Marks: 30 marks

Course Outcomes (COs):

At the end of the course, students will be able to:

- Appraise the theory of Artificial intelligence and list the significance of AI.
- Discuss the various components that are involved in solving an AI problem.
- Illustrate the working of AI Algorithms in the given contrast.
- Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.
- Apply the AI concepts to build an expert system to solve the real-world problems.

Course Content (Artificial Intelligence)

	Details of topic	Duration
Course – 1 -	AI-900 pathway consists of 5 courses and 2 reading material:	05 hours
Azure AI	i. Introduction to AI on Azure	
Fundamentals	ii. Use visual tools to create machine learning models with	
(AI-900)	Azure Machine Learning	
	iii. Explore computer vision in Microsoft Azure	
ayor a	iv. Explore natural language processing	
	v. Explore conversational AI	
	vi. Tune Model Hyperparameters - Azure Machine Learning	
	(Reading)	
	vii. Neural Network Regression: Module Reference - Azure	
	Machine Learning (Reading	
Practical	1. Prepare the data	13 hours
	2. Model the data	
	3. Visualize the data	
	4. Analyse the data	
	5. Deploy and maintain deliverables	

Course – 2 – DA-100 pathway consists of 5 courses and 2 reading material:		08 hours
Data Analyst1. Get started with Microsoft data analytics		
Associate	2. Prepare data for analysis	
(DA-100)	3. Model data in Power BI	
	4. Visualize data in Power BI	
	5. Data analysis in Power BI	
	6. Manage workspaces and datasets in Power BI	
	7. Key Influencers Visualizations Tutorial - Power BI	
	8. Smart Narratives Tutorial - Power BI Microsoft Docs	
Practical	1. Describe Artificial Intelligence workloads and considerations	13 hours
	 Describe fundamental principles of machine learning on Azure 	
	3. Describe features of computer vision workloads on Azure	
	4. Describe features of Natural Language Processing (NLP) workloads on Azure	

References to learning resources:

1. The learning resources made available for the course titled "Azure AI Fundamentals (AI-900) and Data Analyst Associate (DA-100)." on Future Skills Prime Platform of NASSCOM.

Pedagogy

Flipped classroom pedagogy is recommended for the delivery of this course. For every class:

- 1. All the faculty who takes this class should go for a Faculty Development Program on these before starting the session.
- 2. Faculty needs to introduce this course to the students then students need to start learning from Future Skills PRIME platform.
- 3. Faculty also needs to explain the course outcomes and needs of the course and why it is needed for the students.
- 4. Then students need to start learning online after registering on the platform.
- 5. Classroom activities are designed around the topic of the session towards developing better understanding, clearing doubts and discussions of high order thinking skills like application, analysis, evaluation, and design.
- 6. Every theory class ends with announcement of exercise for practical activity of the week.

Exercises:

Practical Exercises	Weightage in marks	
After each chapter students' needs to	No Weightage (But students need to	
complete exercises based on the learning	complete it to move to next chapter).	
in Azure environment.		

Assessment:

Formative Assessment			
Assessment Occasion	Weightage in Marks		
 Summative Assessment: After completion of both the courses, the student can optionally give Assessment for each of the courses on Future Skills Prime platform. Students will have two attempts and those who score at least 50% marks per course will get certificate from NASSCOM- MeitY. 	This assessment may be given 50% weight in computing the final grade of the students.		

