

# MANGALORE UNIVERSITY



## National Education Policy – 2020 [NEP-2020]

Curriculum Structure for

Bachelor of Computer Application (B.C.A) Programme

Syllabus for III and IV semesters

And

Open Elective Courses

## Curriculum for BCA

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

## Course Content for BCA: III and IV Semesters

Semester: III

<b>Course Title:</b> <b>Database Management System</b>	Course code: 21BCA3C7L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

**Course Outcomes (COs):**

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

- Understand 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 design ER diagrams for given real-world problems.
- Represent ER model to relational model and its implementation through SQL.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Understand the transaction processing and concurrency control techniques.

## DSC7: Database Management System (DBMS)

Contents	Hours
<b>Unit-1</b>	
<p><b>Database Architecture:</b> Introduction to Database system applications. Characteristics, Data models, Database schema, Database architecture, Data independence, Database languages, GUIs, and Classification of DBMS.</p> <p><b>E-R Model:</b> 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.</p>	<b>11</b>
<b>Unit-2</b>	
<p><b>Relational Data Model:</b> Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary &amp; foreign key constraints, integrity constraints and null values.</p> <p><b>Data Normalization:</b> Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.</p>	<b>11</b>
<b>Unit-3</b>	
<p><b>INTERACTIVE SQL:</b>Table fundamentals, oracle data types, CREATE TABLE command, Inserting data into table, Viewing Data in the table, sorting data in a table, Creating a table from a table, Inserting data into a table from another table, Delete operations, Updating the contents of a table, Modifying the structure of tables, Renaming tables, destroying tables, displaying table structure.</p> <p><b>DATA CONSTRAINTS :</b>Types of data constraints, IO constraints-The PRIMARY KEY constraint, The FOREIGN KEY constraint, The UNIQUE KEY constraint, Business Rule Constraints- NULL value concepts NOT NULL constraints, CHECK constraint, DEFAULT VALUE concepts.</p> <p><b>COMPUTATIONS ON TABLE DATA:</b> Arithmetic Operators, Logical Operators, Range Searching, Pattern Matching, Oracle Table – DUAL, Oracle Function- Types, Aggregate Function, Date Conversion Function. GROUPING DATA FROM TABLES IN SQL, Group By clause, Having clause, subqueries, JOINS, Using the UNION, INTERSECTION, MINUS clause</p>	<b>10</b>
<b>Unit-4</b>	
<p><b>INTRODUCTION TO PL/SQL:</b> Advantages of PL/SQL, The Generic PL/SQL Block, PL/SQL- The character set, Literals, PL/SQL datatypes, variables, Logical comparisons, Displaying User Messages on The VDU Screen, comments.</p> <p>Control Structure - Conditional Control, Iterative Control</p> <p><b>PL/SQL Transactions:</b>Cursor-Types of Cursor, Cursor Attributes.Explicit cursor- Explicit cursor Management, cursor for loop</p> <p><b>PL/SQL Database Objects:</b> Procedures and Functions, Oracle Packages, Error Handling in PL/SQL.</p>	<b>10</b>

### Text Book:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015

### Reference Books:

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.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

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

### Course Outcomes (COs):

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

- Understand 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

Contents	Hours
<b>Unit-1</b>	
<b>Introduction to .Net Technologies:</b> 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. <b>Introduction to C#:</b> Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations	<b>11</b>
<b>Unit-2</b>	
<b>OOPS with C#:</b> Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions. <b>Introduction to VB.NET:</b> Introduction, VB.NET -IDE – Start page, menu system, tool bars, New project dialog box, graphical designers, code designers, Intellisense, object browser, Toolbox, Solution explorer, property window, dynamic help window, component tray, server explorer, output window, task list, command window	<b>11</b>
<b>Unit-3</b>	
<b>VB.NET Language:</b> 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. Subroutines and Functions in VB.NET.  <b>Application Development on .NET: Vb.NET:</b> Windows Forms. <b>Working with Controls-</b> Textbox, Label, Button Timer, Picture-box, Group-box, Listbox , Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Building Windows Applications using C#	<b>10</b>
<b>Unit-4</b>	
<b>Data Access Connectivity: ADO.NET:</b> Introduction to ADO.NET, ADO vs ADO.NET Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Binding Controls to Databases: Various ways to bind the data, simple binding, complex binding, binding data to control. Programming Web Applications with Web Forms. Web Controls in C#, ASP.NET applications with ADO.NET.	<b>10</b>

### 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.
4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

<b>Course Title:</b> <b>Computer Communication and Networks</b>	Course code: 21BCA3C9L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 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

Contents	Hours
<b>Unit-1</b>	
<b>Introduction: Uses of Computer Networks and its Applications:</b> Business Applications, Home Applications, Mobile Users, Social Issues. <b>Network Hardware</b> -Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks. <b>Reference Models</b> -The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.	<b>11</b>
<b>Unit-2</b>	
<b>The Physical Layer: Transmission Media</b> - Twisted Pair, Coaxial Cable, and Fiber Optics. <b>Wireless Transmission</b> - Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing-Frequency division, time division, code division, Switching. <b>The Data Link Layer:</b> Data link layer design issues-Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction-Error-Correcting Codes, Error -Detecting Codes. Elementary Data Link Protocols-An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol for an Error-Free Channel, A Simplex Protocol for a Noisy Channel. Sliding Window Protocols -A One Bit Sliding Window Protocol, A Protocol Using Go back n, A Protocol using Selective Repeat.	<b>11</b>
<b>Unit-3</b>	
<b>The Network Layer:</b> Network layer design issues-Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual Circuit and Datagram Networks. Routing Algorithms-Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing. Congestion Control Algorithms-Approaches to Congestion Control, Approaches to Congestion	<b>10</b>

Control, Admission Control. The network layer in the Internet-The IP Version 4 Protocol, IP Address, IP Version 6, Internet Control Protocol, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP.	
<b>Unit-4</b>	
<p><b>The Transport Layer:</b> The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, connection Release, Error control and Flow Control. The Internet Transport Protocols-(TCP and UDP)-UDP- Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window,</p> <p><b>The Application Layer:</b> DNS – Domain Name System-The DNS Name Space, Domain Resource Records, Name Servers. Electronic Mail-Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web- Architectural Overview,Static Web Pages, Dynamic Web Pages and Web Applications, HTTP–The HyperText Transfer Protocol</p>	<b>10</b>

**Text Book:**

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.

**Reference Books:**

1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw Hill, 2001.
2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
3. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
4. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
5. <http://higher.ed.mheducation.com/sites/0072967757/index.htmls>

## Semester: IV

Course Title: Python Programming	Course code: 21BCA3C10L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

### Course Outcomes (COs):

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

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

## DSC10: Python Programming

Contents	Hours
<b>Unit-1</b>	
<b>Introduction to Features and Applications of Python;</b> Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. <b>Python Basics:</b> Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. <b>Python Control Flow:</b> Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. <b>Exception Handling:</b> Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition-Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions	<b>11</b>
<b>Unit-2</b>	
<b>Strings:</b> Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods. <b>Lists:</b> Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. <b>Dictionaries:</b> Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. <b>Tuples and Sets:</b> Creating Tuples; Operations on Tuples; Built-in	<b>11</b>



Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	
<b>Unit-3</b>	
<b>File Handling:</b> File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. <b>Object Oriented Programming:</b> Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading. <b>GU Interface:</b> The tkinter Module; Window and Widgets; Layout Management- pack, grid and place	<b>10</b>
<b>Unit-4</b>	
<b>Python SQLite:</b> The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records. <b>Data Analysis:</b> NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. <b>Data Visualisation:</b> Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart	<b>10</b>

#### References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2<sup>nd</sup> Edition, Green Tea Press. Freely available online @ <https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.
8. <http://www.ibiblio.org/g2swap/byteofpython/read/>
9. <https://docs.python.org/3/tutorial/index.html>

<b>Course Title:</b> <b>Computer Multimedia &amp; Animation</b>	Course code: 21BCA3C11L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

**Course Outcomes (COs):**

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

- Write a well-designed, interactive Web site with respect to current standards and practices.
- Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting language.
- Determine the appropriate use of interactive versus standalone Web applications.

**DSC11: Computer Multimedia & Animation**

Contents	Hours
<b>Unit-1</b>	
<b>Web Design:</b> Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. <b>CSS:</b> Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and tags; Overview and features of CSS3. <b>JavaScript:</b> Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input.	<b>11</b>
<b>Unit-2</b>	
<b>Animation:</b> Introduction, Start and End States, Interpolation, Animations in HTML. All About CSS Animations, Creating a Simple Animation, Detailed Look at the CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. All About CSS Transitions, Adding a Transition, Looking at Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions.	<b>11</b>
<b>Unit-3</b>	
<b>HTML5 – SVG:</b> Viewing SVG Files, Embedding SVG in HTML5, HTML5 – SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star	<b>10</b>
<b>Unit-4</b>	
<b>HTML5 – CANVAS:</b> The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients, HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas - Animations.	<b>10</b>

**References:**

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
2. Animation in HTML, CSS, and JavaScript, KirupaChinnathambi, 1st Edition, Createspace Independent Pub, 2013.
3. <https://www.w3.org/Style/CSS/current-work#CSS3>
4. <http://bedford-computing.co.uk/learning/cascading-style-sheets-css/>

<b>Course Title: Operating System Concepts</b>	Course code: 21BCA3C12L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

### Course Outcomes (COs):

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

- Understand the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

### DSC12: Operating System Concepts

Contents	Hours
<b>Unit-1</b>	
<p><b>Introduction to Operating System:</b> Definition, History and Examples of Operating System; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure.</p> <p><b>File System:</b> File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management.</p>	<b>10</b>
<b>Unit-2</b>	
<p><b>Memory Management:</b> Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging.</p> <p><b>Virtual Memory:</b> Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing</p> <p><b>Disk Scheduling (I/O Management):</b> Introduction and Scheduling Algorithm</p>	<b>10</b>
<b>Unit-3</b>	
<p><b>Process Management:</b> Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- IPC Implementation Methods- Shared Memory and Message Passing;</p> <p><b>CPU Scheduling:</b> Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling</p>	<b>11</b>
<b>Unit-4</b>	
<p><b>Process Synchronization:</b> Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining</p>	

<p>Philosophers Problem; Monitors.  <b>Deadlocks:</b> System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock.  <b>Multithreaded Programming:</b> Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues.</p>	<b>11</b>
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**Text Book:**

1. Operating System Concepts, Silberschatz' et al., 10thEdition, Wiley, 2018.

**Reference Books:**

2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson

## Skill Enhancement Course: SEC for other Programmes

### Semester: III

<b>Course Title: Artificial Intelligence</b>	Course Credits: 2
Total Contact Hours: 13 hours of theory and 26 hours of practical	Duration of SEE: 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

Contents	Hours
<b>Unit-1</b>	
<b>Overview of AI:</b> Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI. <b>Intelligent Systems:</b> Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.	<b>05</b>
<b>Unit-2</b>	
<b>AI Applications:</b> Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing. <b>AI Examples in daily life:</b> Installation of AI apps and instructions to use AI apps.	<b>05</b>
<b>Unit-3</b>	
<b>Robotics:</b> Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.	<b>03</b>

<p><b>Laboratory Activities:</b></p> <ul style="list-style-type: none"> <li>• <b>Amazon Alexa:</b> <a href="https://play.google.com/store/apps/details?id=com.amazon.dee.app&amp;hl=en&amp;am p;gl=US">https://play.google.com/store/apps/details?id=com.amazon.dee.app&amp;hl=en&amp;am p;gl=US</a></li> <li>• <b>Google Lens:</b> <a href="https://play.google.com/store/search?q=google+lens&amp;c=apps&amp;hl=en&amp;gl=US">https://play.google.com/store/search?q=google+lens&amp;c=apps&amp;hl=en&amp;gl=US</a></li> <li>• <b>Image to Text to Speech ML OCR:</b> <a href="https://play.google.com/store/apps/details?id=com.mlscanner.image.text.speech&amp;hl=en_IN&amp;gl=US">https://play.google.com/store/apps/details?id=com.mlscanner.image.text.speech&amp;hl=en_IN&amp;gl=US</a></li> <li>• <b>Google Pay:</b> <a href="https://play.google.com/store/apps/details?id=com.google.android.apps.nb u.paisa .user&amp;hl=en_IN&amp;gl=US">https://play.google.com/store/apps/details?id=com.google.android.apps.nb u.paisa .user&amp;hl=en_IN&amp;gl=US</a></li> </ul>	<b>26</b>
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- **Grammarly:**  
[https://play.google.com/store/search?q=grammarly&c=apps&hl=en\\_IN&gl=](https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl=)
- **Google Map:**  
<https://play.google.com/store/search?q=google+maps&c=apps&hl=en&gl=US>
- **FaceApp:**  
[https://play.google.com/store/apps/details?id=io.faceapp&hl=en\\_IN&gl=US](https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US)
- **Socratic:**  
[https://play.google.com/store/apps/details?id=com.google.socratic&hl=en\\_IN&gl=US](https://play.google.com/store/apps/details?id=com.google.socratic&hl=en_IN&gl=US)
- **Google Fit: Activity Tracking:**  
[https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en\\_IN&gl=US](https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en_IN&gl=US)
- **SwiftKey Keyboard:**  
<https://swiftkey-keyboard.en.uptodown.com/android>
- **E-commerce App:**  
[https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en\\_IN&gl=US](https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en_IN&gl=US)

### Text Book:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", 2nd Edition, Springer International Publishing 2017.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", 2nd Edition, Pearson Education Limited 2005.

### Reference Books:

1. [https://www.tutorialspoint.com/artificial\\_intelligence/artificial\\_intelligence\\_tutorial.pdf](https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf)
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, July 2017.

### Reference Links:

1. Voice Assistant: <https://alan.app/blog/voiceassistant-2/>
2. Browse with image: <https://www.pocket-lint.com/apps/news/google/141075-what-is-google-lens-and-how-does-it-work-and-which-devices-have-it>
3. OCR: <https://aws.amazon.com/what-is/ocr/>
4. Mobile Payment system: <https://gocardless.com/en-us/guides/posts/how-do-mobilepayment-systems-work/>
5. Grammarly: <https://techjury.net/blog/how-to-use-grammarly/#gref>
6. Travel & Navigation: <https://blog.google/products/maps/google-maps-101-ai-powernew-features-io-2021/>
7. AI in photo editing: <https://digital-photography-school.com/artificial-intelligencechanged-photo-editing/>
8. AI in education: <https://www.makeuseof.com/what-is-google-socratic-how-does-itwork/>
9. AI in health and fitness: <https://cubettech.com/resources/blog/implementing-machinelearning-and-ai-in-health-and-fitness/>
10. E-commerce and online shopping: <https://medium.com/@nyxonedigital/importanceof-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416>

## Open Source Tools

**(Skill Enhancement Course: SEC for BCA Course)**

Semester: III

Course Title: <b>Open Source Tools</b>	Course Credits: 2 (1L+0T+2P)
Semester: III	Duration of SEE: 01 Hour
Total Contact Hours: 13 hours of theory and 26-28 hours of practicals	SEE: 30 Marks IA: 20 Marks

### Course Outcomes (COs):

- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

### Course Content: Open Source Tools

Module	Details	Duration
<b>Module 1: Open Source Softwares</b>	<ul style="list-style-type: none"><li>• Introduction to Open sources, Need of Open Sources, Open Source –Principles, Standard Requirements, Advantages of Open Sources –</li><li>• Free Software – FOSS</li><li>• Licenses – GPL, LGPL, Copyrights, Patents, Contracts &amp; Licenses and Related Issues</li><li>• Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU</li></ul>	<b>05 hours</b>
<b>Module 2: Programming Tools And Techniques</b>	<ul style="list-style-type: none"><li>• Usage of design Tools like Argo UML or equivalent</li><li>• Version Control Systems like Git or equivalent</li><li>• Bug Tracking Systems (Trac, BugZilla)</li><li>• BootStrap</li></ul>	<b>04hours</b>
<b>Module 3: Case Studies</b>	<ul style="list-style-type: none"><li>• Apache</li><li>• Berkeley Software Distribution</li><li>• Mozilla (Firefox)</li><li>• Wikipedia</li><li>• Joomla</li><li>• GNU Compiler Collection</li><li>• Libre Office</li></ul>	<b>04 hours</b>

### Text Book:

1. KailashVadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt. Ltd 2012, 1st Edition.

### Reference Book:

1. Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

# Question Paper Pattern for Skill Enhancement Course

## Artificial Intelligence and Open Source Tools

Duration: 1 Hour

Max. Marks: 30

### Part-A

(This section shall contain four questions from each module. Each question carries one mark)

#### Module-1:

- 1.
- 2.
- 3.
- 4.

#### Module-2:

- 5.
- 6.
- 7.
- 8.

#### Module-3:

- 9.
- 10.
- 11.
- 12.

### Part-B

(This section shall contain two full questions from each module having an internal choice. Each full question carries six marks)

#### Module-1:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions

#### Module-2:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions

#### Module-3:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions



## Open Elective for III Semester: Programming in C

<b>Course Title:</b> <b>Programming in C Concepts</b>	Course Credits: 3 (3L+0T+0P)
Semester: III	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

### Course Outcomes (COs):

**After completing this course satisfactorily, a student will be able to:**

- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays
- Understand functions and file concepts of C language

### Course Contents:

Contents	Hours
<b>Unit-1</b>	
<p><b>Overview of C:</b> Importance of C Program, Basic structure of a C-program, Execution of a C Program.</p> <p><b>C Programming Basic Concepts:</b> Character set, Tokens, Keywords, Constants, Symbolic constants, Variables, Data types,</p> <p><b>Input and output with C:</b> Formatted I/O functions – <i>printf</i> and <i>scanf</i>, control stings and escape sequences, output specifications with <i>printf</i> functions; Unformatted I/O functions to read and display single character and astring-<i>getchar</i>, <i>putchar</i>, <i>gets</i> and <i>puts</i> functions.</p>	<b>11</b>
<b>Unit-2</b>	
<p><b>Operators &amp; Expressions:</b> Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment &amp; Decrement operators; Bitwise operators; Conditional operator; Operator Precedence and Associativity; Evaluation of arithmetic expressions;</p> <p><b>Control Structures:</b> Decision Making and Branching -Decision making with if statement, simple if statement, the if else statement, nesting of if...else statements, the else if ladder, the switch statement, ?: operator, the go to statement.</p>	<b>11</b>
<b>Unit-3</b>	
<p><b>Looping Structures:</b> Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, Jumps in loops.</p> <p><b>Derived data types in C:</b> Arrays-declaration, initialization and access of one-dimensional and two-dimensional arrays.</p>	<b>10</b>

#### Unit -4

**Handling of Strings:** Declaring and initializing string variables, reading strings from terminal, writing strings to screen, String handling functions - *strlen*, *strcmp*, *strcpy*, *strstr* and *strcat*; Character handling functions - *tolower*, *toupper*, *isalpha*, *isnumeric*.

**Functions:** Basics of functions, Parameter Passing, Simple functions

**File handling:** Basics of file programming concepts- *fprintf* and *fscanf*, and example programs

10

#### Text Book:

1. E.Balagurusamy, Programming in ANSI C ,7<sup>th</sup> Edition, Tata McGraw Hill

#### Reference Books:

2. Herbert Schildt, C: The Complete Reference, 4<sup>th</sup> Edition.
3. Brian W. Kernighan and Dennis Ritchie, The C Programming Language, Second Edition.

## Open Elective for III Semester: R Programming

<b>Course Title: R PROGRAMMING</b>	Course Credits: 3 (3L+0T+0P)
<b>Semester: III</b>	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

### Course Outcomes (COs):

- Understand the basics of Fundamentals of R.
- Understands the loading, retrieval techniques of data.
- Understand how data is analyzed and visualized using statistic functions.

### Course Contents:

Contents	Hours
<b>Unit-1</b>	
<p><b>Introduction to R:</b> Basics, Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, Comments – Handling Packages in R: Installing R Package, Commands: installed.packages(), package Description(), help(), find. Package (), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.</p> <p><b>R Data Types:</b> Vectors, Lists, Matrices, Arrays, Factors, Data Frame</p> <p><b>R - Variables:</b> Variable assignment, Data types of Variable, Finding Variable Is(), Deleting Variables.</p>	<b>11</b>
<b>Unit-2</b>	
<p><b>R Operators:</b> Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators</p> <p><b>R Decision Making:</b> if statement, if – else statement, if – else if statement, switch statement</p> <p><b>R Loops:</b> repeat loop, while loop, for loop - Loop control statement: break statement, next statement.</p> <p><b>R-Functions</b> : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values</p> <p><b>R-Strings</b> – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower()</p> <p><b>R Vectors</b> – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting</p> <p><b>R List</b> - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector</p> <p><b>R Matrices</b> – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division</p>	<b>11</b>

<b>Unit-3</b>	
<p><b>R Arrays:</b> Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements</p> <p><b>R Factors</b> –creating factors, generating factor levels gl().</p> <p><b>Data Frames</b> –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame</p> <p><b>Expand Data Frame:</b> Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().</p>	<b>10</b>
<b>Unit-4</b>	
<p><b>Loading and handling Data in R: Getting and Setting the Working Directory</b> – getwd(), setwd(), dir()</p> <p><b>R-CSV Files</b> - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File</p> <p><b>R -Excel File</b> – Reading the Excel file.</p>	<b>10</b>

### **Text Book:**

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.

### **Reference Books:**

2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.
3. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from [https://www.tutorialspoint.com/r/r\\_tutorial.pdf](https://www.tutorialspoint.com/r/r_tutorial.pdf).
4. Andrie de Vries, JorisMeys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8.

## Open Elective for IV Semester: Python Programming Concepts

<b>Course Title:</b> <b>Python Programming Concepts</b>	Course Credits: 3 (3L+0T+0P)
Semester: IV	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

### Course Outcomes (COs):

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in handling of loops and the creation of functions.
- Identify the methods to create and manipulate string data types.
- Understand the notion of arrays, lists, tuples and their applications

### Course contents:

Contents	Hours
<b>Unit-1</b>	
<b>Introduction to Features and Applications of Python;</b> Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments;	<b>10</b>
<b>Unit-2</b>	
Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs; Libraries for graphics and image handling. <b>Python Control Flow:</b> Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.	<b>10</b>
<b>Unit-3</b>	
<b>Strings:</b> Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs. <b>Other data types:</b> Basics of arrays, lists, tuples and related functions	<b>11</b>
<b>Unit-4</b>	
<b>Python Functions:</b> Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs	<b>11</b>

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## **Text Book:**

1. Python Programming: Using Problem Solving Approach, Reema Thareja, June 2017.

## **Reference Books:**

1. Learning with Python, Allen Downey, Jeffrey Elkner, Chris Meyers, 2015  
(Freely available online 2015.  
@<https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>)
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. <http://www.ibiblio.org/g2swap/byteofpython/read/>
4. [http://scipy-lectures.org/intro/language/python\\_language.html](http://scipy-lectures.org/intro/language/python_language.html)
5. <https://docs.python.org/3/tutorial/index.html>

## Open Elective for IV Semester: E-COMMERCE

<b>Course Title: E-Commerce</b>	Course Credits: 3 (3L+0T+0P)
<b>Semester: IV</b>	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

### Course Outcomes (COs):

- Compare how internet and other information technologies support business processes.
- Demonstrate an overall perspective of the importance of application of internet technologies in business administration
- Explain the basic business management concepts.
- Demonstrate the basic technical concepts relating to E-Commerce.
- Identify the security issues, threats and challenges of E-Commerce.

### Course Contents:

Contents	Hours
<b>Unit-1</b>	
<b>Introduction to E-Commerce and Technology Infrastructure</b> Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5, Building an E-Commerce Website, Mobile Site and Apps <b>Systematic approach to build an E-Commerce:</b> Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App	<b>11</b>
<b>Unit-2</b>	
<b>E-Commerce Security and Payment Systems</b> E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems	<b>11</b>
<b>Unit-3</b>	
<b>Business Concepts in E-Commerce</b> Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce	<b>10</b>
<b>Unit-4</b>	
<b>Project Case Study</b> Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart	<b>10</b>

### Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

### Reference Books:

1. <http://docs.opencart.com/>
2. <http://devdocs.magento.com/>
3. <http://doc.prestashop.com/display/PS15/Developer+tutorials>
4. RobbertRavensbergen, —Building E-Commerce Solutions with Woo Commercell, PACKT, 2nd Edition.