Academic Council:16/11/2024

Item No:3.2

Parle Tilak Vidyalaya Association's

MULUND COLLEGE OF COMMERCE (AUTONOMOUS)

|| आ नो भद्राः क्रतवो यन्तु विश्वतः ||

Syllabus for T.Y. Bachelor of Computer Applications

Programme: B.C.A.

BASED ON LEARNING OUTCOME CURRICULUM FRAMEWORK (LOCF)

Semester VI

with effect from the academic year

2025 – 2026

AC: **16/11/2024**
Item No: **3.2**

Parle Tilak Vidyalaya Association's
MULUND COLLEGE OF COMMERCE (AUTONOMOUS)

Sr. No.	Heading	Particulars
1.	Title of the Programme	**Bachelor of Computer Applications**
2.	Eligibility for Admission	S.Y.BCA.
3.	Passing Marks	40%
4.	Ordinances / Regulations (if, any)	As applicable for all B.Sc. Programmes, University of Mumbai
5.	Number of years / Semesters	Three years – Six Semesters
6.	Level	~~P.G.~~ / U.G. /~~Diploma / Certificate~~ (Strike out which is not applicable)
7.	Pattern	~~Yearly /~~ Semester, Choice Based (Strike out which is not applicable)
8.	Status	New / ~~Revised~~
9.	To be implemented from Academic year	From the Academic Year **2025 – 2026**

Date: November 16, 2024
Name of the BoS Chairperson

Signature: _____

Dr. Hiren Dand
hiren.dand@mccmulund.ac.in

Semester – 6			
Course Code	**Course Type**	**Course Title**	**Credits**
MCCSCT404	Major	Enterprise Java	4
MCCSCT324	Major	Human Computer Interaction	4
MCCSCT314	Major	Cloud Computing Fundamentals	2
MCCSCT304	Minor	Data Science Fundamentals	4
MCCSCT315	VSEC (Choose any one)	IT Service Management	2
MCCSCT316		Cyber Laws and Patents	
MCCSCT229	VSEC (Choose any one)	Introduction to Robotic Process Automation	2
MCCSCT325		Mobile App Development	
MCCSCTPRJ402	RP	CAPSTONE Project	4
		Total Credits	**22**

OE/GE: Open Elective/ General Elective
AEC: Ability Enhancement Course
VEC: Value Education Course
IKS: Indian Knowledge System
SEC: Skill Enhancement Course
VSEC: Vocational & Skill Enhancement Course
RP/OJT: Research Project / On Job Training

Contents

Semester VI

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MCCSCT404 Enterprise Java

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Enterprise Java		**Course Code: MCCSCT404**		
Vertical:		**Major**		
Periods per week (1 Period is 60 minutes)		**3**		
Practical per week (1 Period is 60 minutes)		**2**		
Credits		**4**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**40**	**16**
	End Semester Examination	**2**	**60**	**24**
Practical	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course Objectives:

1. Gain a comprehensive understanding of Java Enterprise Edition (Java EE) and its role in developing enterprise applications, including knowledge of Java EE technologies, architecture, and server/container concepts.
2. Learn advanced concepts in Java Servlets, including request dispatching, working with cookies and sessions, and handling file uploads and downloads, to enhance the functionality and interactivity of web applications.
3. Acquire a thorough understanding of Java Server Pages (JSP) and its advantages over servlets, including knowledge of JSP lifecycle, action elements, implicit objects, and the usage of Java Server Pages Standard Tag Libraries (JSTL).
4. Explore Enterprise JavaBeans (EJB) and its role in enterprise application development, including understanding the architecture, types of session beans, message-driven beans, interceptors, and the Java Naming and Directory Interface (JNDI).
5. Understand the concept of persistence in Java and Object/Relational Mapping (ORM), and gain proficiency in using Java Persistence API (JPA) and Hibernate frameworks for database interaction and management.

Module	Name	Lectures
I.	**Building Enterprise Applications with Java EE: An Introduction to Servlets, Architecture, and Database Integration**	**9**
II.	**Advanced Java Servlets: Request Dispatchers, Sessions, Cookies, File Handling, and Non-Blocking I/O**	**9**
III.	**Mastering Java Server Pages (JSP): Basics, Features, and Best Practices for Dynamic Web Development**	**9**
IV.	**Exploring Enterprise JavaBeans (EJB): Architecture, Session Beans, Message-Driven Beans, and JNDI Integration**	**9**
V.	**Mastering Persistence in Java: JPA and Hibernate for Object-Relational Mapping (ORM) and Web Application Development**	**9**
	Total	**45**

R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create

Unit	Details	Level of Knowledge Applicable as per Blooms Taxonomy
I	**Building Enterprise Applications with Java EE: An Introduction to Servlets, Architecture, and Database Integration:** A. **Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server B. **Java EE Architecture, Server and Containers:** Types of System Architecture, Java EE Server, Java EE Containers. C. **Introduction to Java Servlets:** The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? D. **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet E. **Working with Servlets:** Getting Started, Using Annotations Instead of Deployment Descriptor. F. **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	**A. U, R** **B. U, R** **C. U, EV** **D. U, R, EV** **E. U, AN** **F. U, EV**
II	**Advanced Java Servlets: Request Dispatchers, Sessions, Cookies, File Handling, and Non-Blocking I/O:**	**A. U, A, AN**

	A. **Request Dispatcher:** Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application. B. **COOKIES:** Kinds of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing the Colors of A Page C. **SESSION:** What Are Sessions? Lifecycle of Http Session, Session Tracking With Servlet API, A Servlet Session Example D. **Working with Files:** Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application. E. **Working with Non-Blocking I/O:** Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp	**B. U, EV, CR** **C. U, R, EV** **D. R, CR** **E. CR, EV**
III	**Mastering Java Server Pages (JSP): Basics, Features, and Best Practices for Dynamic Web Development:** A. **Introduction To Java Server Pages:** Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages B. **Getting Started With Java Server Pages:** Comments, JSP Document, JSP Elements, JSP GUI Example. C. **Action Elements:** Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean. D. **Implicit Objects, Scope and El Expressions:** Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language. E. **Java Server Pages Standard Tag Libraries:** What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.	**A. U, R** **B. U, EV** **C. U, R, EV** **D. U, AN** **E. U, EV**
IV	**Exploring Enterprise JavaBeans (EJB): Architecture, Session Beans, Message-Driven Beans, and JNDI Integration:** A. **Introduction To Enterprise Javabeans:** Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans B. **Working with Session Beans:** When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.	**A. U, EV** **B. A, R, CR** **C. U, R, CR** **D. AN, CR, R**

	C. **Working with Message Driven Beans:** Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example. D. **Interceptors:** Request and Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. E. **Java Naming and Directory Interface**: What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE.	**E. U, R, CR**
V	**Mastering Persistence in Java: JPA and Hibernate for Object-Relational Mapping (ORM) and Web Application Development:** A. **Persistence, Object/Relational Mapping And JPA:** What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping, B. **Introduction to Java Persistence API:** The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. C. **Writing JPA Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running the JPA Application. D. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works? **E. Writing Hibernate Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, creating a Web Application, Adding the Required Library Files, creating a Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.	**A. U, R** **B. R, U, EV** **C. U, AN** **D. U, R, AN** **E. U, R, EV**

List of Practical		
Sr. No.	**Syllabus**	**Level of Knowledge Applicable as**

		per Blooms Taxonomy
1.	**Implement the following Simple Servlet applications.**	**CR, AN**
a.	Create a simple calculator application using servlet.	
b.	Create a servlet for a login page. If the username and password are correct then it says message “Hello <username>” else a message “login failed”	
c.	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.	
2.	**Implement the following Servlet applications with Cookies and Sessions.**	**CR, AN, U**
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.	
b.	Create a servlet that uses Cookies to store the number of times a user has visited servlet.	
c.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.	
3.	**Implement the Servlet IO and File applications.**	**CR, R, AN**
a.	Create a Servlet application to upload and download a file.	
b.	Develop Simple Servlet Question Answer Application using Database.	
c.	Create simple Servlet application to demonstrate Non-Blocking Read Operation.	
4.	**Implement the following JSP applications.**	**CR, AN, U**
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.	

b.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).	
c.	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.	
5.	**Implement the following JSP JSTL and EL Applications.**	**CR, AN, R**
a.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.	
b.	Create a JSP page to demonstrate the use of Expression language.	
c.	Create a JSP application to demonstrate the use of JSTL.	
6.	**Implement the following EJB Applications.**	**CR, AN, A**
a.	Create a Currency Converter application using EJB.	
b.	Develop a Simple Room Reservation System Application Using EJB.	
c.	Develop simple shopping cart application using EJB [Stateful Session Bean].	
7.	**Implement the following EJB applications with different types of Beans.**	**CR, A**
a.	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.	
b.	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	
c.	Develop simple Marks Entry Application to demonstrate accessing Database using EJB.	
8.	**Implement the following JPA applications.**	**CR, A, U**
a.	Develop a simple Inventory Application Using JPA.	
b.	Develop a Guestbook Application Using JPA.	
c.	Create simple JPA application to store and retrieve Book details.	

9.	**Implement the following JPA applications with ORM and Hibernate.**	**CR, A, AN**
a.	Develop a JPA Application to demonstrate use of ORM associations.	
b.	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.	
c.	Develop a Hibernate application to store and retrieve employee details in MySQL Database.	
10.	**Implement the following Hibernate applications.**	**CR, U, A**
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.	
b.	Develop Hibernate application to enter and retrieve course details with ORM Mapping.	
c.	Develop a five page web application site using any two or three Java EE Technologies.	

Learning Outcomes:

After completion of the course students are supposed to be able to:

1. Develop the ability to design and implement dynamic web applications using Java Servlets and integrate them with databases, leveraging the Java Servlet API and JDBC for efficient data access.
2. Apply the knowledge gained to build robust web applications using Java Servlets, incorporating features such as request dispatching, cookie management, session tracking, and file handling.
3. Develop the ability to design and implement dynamic web pages using JSP, utilizing JSP elements, expressions, and JSTL tags to enhance code readability, modularity, and maintainability.
4. Apply the knowledge gained to develop and deploy enterprise applications using EJB, leveraging session beans, message-driven beans, interceptors, and JNDI for scalable and maintainable solutions.
5. Develop the ability to build database-driven applications using JPA and Hibernate, including designing and implementing entity classes, configuring persistence units, and performing database operations effectively.

Books and References:

1. Shah, S., & Shah, V. (2017). Java EE 7 for beginners (1st ed.). SPD.
2. Moraes, E. (2018). Java EE 8 cookbook: Build reliable applications with the most robust and mature technology for enterprise development (1st ed.). Packt.
3. Roy, U. K. (2015). Advanced Java programming. Oxford Press.
4. Basham, B., Sierra, K., & Bates, B. (2008). Head first servlets and JSP (2nd ed.). O'Reilly.
5. Bauer, C., & King, G. (2015). Java persistence with Hibernate (2nd ed.). Manning Publications.
6. Schildt, H. (2013). Java EE 7: The complete reference (1st ed.). McGraw-Hill Education.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Create**	
% in Question Paper	**20**	**30**	**10**	**10**	**5**	**25**	**100%**

MCCSCT324 Human Computer Interaction

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Human Computer Interaction		**Course Code: MCCSCT324**		
Vertical:		**Major**		
Periods per week (1 Period is 60 minutes)		**03**		
Practical per week (1 period is 60 minutes)		**02**		
Credits		**04**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**-**	**40**	**16**
	End Semester Examination	**2**	**60**	**24**
Practical	**Continuous Internal Assessment**	**-**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course Objectives:

1. Understand the fundamental concepts of interaction design and its role in creating meaningful user experiences.
2. Explore various cognitive frameworks and theories that explain how humans process information, make decisions, and interact with technology.
3. To teach students how to design user-centered interfaces by understanding cognitive, social, and emotional factors, and using data gathering and analysis techniques to inform design decisions.
4. To teach students how to collect and analyze data, define user requirements, create prototypes, and apply interaction design practices using tools, design patterns, and AgileUX.

5. To teach students evaluation methods in interaction design, including usability testing, field studies, heuristic evaluations, A/B testing, and predictive models.

Module	Name	Lectures
I.	**Foundations of Interaction Design: Principles, Processes, and Conceptual Frameworks**	9
II.	**Human-Centered Interaction Design: Cognitive, Social, and Emotional Perspectives**	9
III.	**Designing Interactions: Interfaces, Data Gathering, and Analysis Techniques**	9
IV.	**From Data to Design: Collecting, Prototyping, and Implementing Interaction Design**	9
V.	**Evaluation in Interaction Design: Methods, Studies, and Analytical Approaches**	9

R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR – Create

Unit	Details	Level of Knowledge Applicable as per Blooms Taxonomy
I	**<u>Foundations of Interaction Design: Principles, Processes, and Conceptual Frameworks</u>** A. **What is interaction design?:** Introduction, Good and Poor Design, What Is Interaction Design?, The User Experience , Understanding Users, Accessibility and Inclusiveness, Usability and User Experience Goals. B. **The process of interaction design** : Introduction, What Is Involved in Interaction Design?, Some Practical Issues. C. **Conceptualizing interaction:** Introduction, Conceptualizing Interaction, Conceptual Models, Interface Metaphors, Interaction Types, Paradigms, Visions, Theories, Models, and Frameworks.	**A. R, U** **B. R,U,AN** **C. R, U, EV**
II	**<u>Human-Centered Interaction Design: Cognitive, Social, and Emotional Perspectives</u>** A. **Cognitive aspects :** Introduction, What Is Cognition?, Cognitive Frameworks. B. **Social interaction :** Introduction, Being Social, Face-to-Face Conversations, Remote Conversations, Co-presence, Social Engagement. C. **Emotional interaction:** Introduction, Emotions and the User Experience, Expressive Interfaces and Emotional Design, Annoying Interfaces, Affective Computing and	**A. U, R, AN** **B. U, R** **C. U, R**

	Emotional AI, Persuasive Technologies and Behavioral Change, Anthropomorphism.	
III	**<u>Designing Interactions: Interfaces, Data Gathering, and Analysis Techniques</u>** A. **Interfaces:** Introduction, Interface Types, Natural User Interfaces and Beyond, Which Interface? B. **Data gathering:** Introduction, Five Key Issues, Data Recording, Interviews, Questionnaires, Observation, Choosing and Combining Techniques. C. **Data analysis, interpretation, and presentation:** Introduction, Quantitative and Qualitative, Basic Quantitative Analysis, Basic Qualitative Analysis, Which Kind of Analytic Framework to Use?, Tools to Support Data Analysis, Interpreting and Presenting the Findings	**A. U, R** **B. U, R, EV, AN** **C. U, R, A**
IV	**<u>From Data to Design: Collecting, Prototyping, and Implementing Interaction Design</u>** A. **Data at scale** : Introduction, Approaches to Collecting and Analyzing Data, Visualizing and Exploring Data, Ethical Design Concerns, B. **Discovering requirements**: Introduction, What, How, and Why?, What Are Requirements?, Data Gathering for Requirements, Bringing Requirements to Life: Personas and Scenarios, Capturing Interaction with Use Cases. C. **Design, prototyping, and construction** : Introduction, Prototyping, Conceptual Design, Concrete Design, Generating Prototypes, Construction. D. **Interaction design in practice:** Introduction, AgileUX, Design Patterns, Open Source Resources, Tools for Interaction Design	**A. U, R, A, AN** **B. U, R** **C. U, R, CR** **D. U, R, A**
V	**<u>Evaluation in Interaction Design: Methods, Studies, and Analytical Approaches</u>** A. **Introducing evaluation** : Introduction, The Why, What, Where, and When of Evaluation, Types of Evaluation, Evaluation Case Studies, What Did We Learn from the Case Studies? Other Issues to Consider When Doing Evaluation. B. **Evaluation studies: from controlled to natural settings :** Introduction, Usability Testing, Conducting Experiments, Field Studies. **C. Evaluation: inspections, analytics, and models:** Introduction, Inspections: Heuristic Evaluation and Walk-Throughs, Analytics and A/B Testing Predictive Models	**A. U, R, EV, AN** **B. U, R** **C. U, R, AN, EV**

List of Practicals		
Sr.No.	**Syllabus**	**Level of Knowledge Applicable as per Blooms Taxonomy**
1	Building a Graphical User Interface depending on type of users of the application.	U, CR, A
2	Take up any GUI and suggest changes to it based on principles of good interface design and redesign the GUI.	U, CR, A
3	Design a navigator for a person new in tourist city/ village using proper windows and screen controls.	U, CR, A
4	Design a menu (horizontal and vertical)for an app that helps the user in planning his fitness training routine.	U, CR, A
5	Design appropriate icons pertaining to a particular domain say for example Wedding Cards.	U, CR, A
6	Demonstrate the effect of typographic design on readability.	U, CR, A
7	Design a prototype of a TV remote control using standard buttons provided	U, CR, A
8	Design a personal website for a gym trainer.	U, CR, A
9	Perform Trunk Test on this site and provide the solution using the screen shots.	U, CR, A,EV
10	Perform Usability evaluation using any online tool like UMTEL	U, CR, A,EV

Learning Outcomes:

After completion of the course students are supposed to be able to:

1. Define and explain the core principles, processes, and conceptual frameworks in interaction design, including the role of usability and user experience.
2. Describe how cognitive, social, and emotional aspects influence user interactions and design decisions.
3. Apply data gathering and analysis techniques (such as interviews, questionnaires, and usability testing) to inform interaction design decisions.
4. Analyze and synthesize data, requirements, and user feedback to generate effective prototypes and design solutions.
5. Evaluate interaction designs using various methods (such as usability testing, A/B testing, and heuristic evaluations) and critically assess the findings to improve design outcomes.

Books and References:

1. Sharp, H., Preece, J., & Rogers, Y. (2019). Interaction design: Beyond human-computer interaction (5th ed.). John Wiley & Sons, Inc.
2. Dix, A., Finlay, J., Abowd, G. D., & Beale, R. (2004). Human-computer interaction (3rd ed.). Pearson Education Limited.
3. Norman, D. (2013). The design of everyday things (Revised and expanded ed.). Basic Books.

4. MacKenzie, I. S. (2013). Human-computer interaction: An empirical research perspective (1st ed.). Morgan Kaufmann.
5. Garrett, J. J. (2010). The elements of user experience: User-centered design for the web (2nd ed.). New Riders.
6. Helander, M. G., Landauer, T. K., & Prabhu, P. V. (Eds.). (2006). Handbook of human-computer interaction (2nd ed.). Elsevier.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**35%**	**30%**	**10%**	**10%**	**10%**	**5%**	**100%**

MCCSCT314 Cloud Computing Fundamentals

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Cloud Computing Fundamentals		**Course Code: MCCSCT314**		
Vertical:		**Major**		
Periods per week (1 Period is 60 minutes)		**02**		
Credits		**02**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course Objectives:

1. Understand the concepts and technologies related to distributed systems and scalable computing over the internet.
2. Gain knowledge of design principles, job/resource management, and virtualization techniques in computer clusters and data centers.
3. Explore Microsoft Azure services, subscriptions, and resource management using Azure Resource Manager.
4. Learn about storage management in Azure, including different storage types and configuring storage accounts.
5. Develop skills in deploying and configuring Azure virtual machines, considering architectural considerations and cost-saving opportunities.

Module	**Name**	**Lectures**

1.	**Design and Optimization of Scalable Distributed Systems: From Cloud Computing to Computer Clusters for High-Performance Parallelism**	**9**
2.	**Design and Management of Virtualized Computer Clusters for Scalable and Efficient Data Center Operations**	**9**
3.	**Managing and Optimizing Cloud Resources with Microsoft Azure: An Introduction to Azure Services and Resource Management Tools**	**9**
4.	**Building and Managing Scalable Infrastructure on Microsoft Azure: Storage Solutions and Network Topology**	**9**
5.	**Deploying and Managing Virtual Machines on Microsoft Azure: Best Practices for Configuration, Cost Optimization, and Scalability**	**9**
	Total :	**45**

Unit	Details	Lectures
I	**<u>Design and Optimization of Scalable Distributed Systems: From Cloud Computing to Computer Clusters for High-Performance Parallelism:</u>** A. **IKS in Cloud Computing:** Nalanda and Takshashila, Dharma, Vedic Texts / Mantras, Mahabharata's decisionmaking models, Ancient Indian manuscripts. B. **Distributed System Models and Enabling Technologies:** Scalable Computing Over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security, and Energy Efficiency, Bibliographic Notes and Homework Problems. C. **Computer Clusters for Scalable Parallel Computing:** Clustering for Massive Parallelism, Computer Clusters and MPP Architectures,	**A) C,R,AN** **B) U, R** **C) U, R**
II	**Design and Management of Virtualized Computer Clusters for Scalable and Efficient Data Center Operations:** A. **Design Principles, Job and Resource management of computer Cluster:** Design Principles of Computer Clusters, Cluster Job and Resource Management, Case Studies of Top Supercomputer Systems. B. **Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual	**A. U, R** **B. U, R**

	Clusters and Resource Management, Virtualization for Data-Center Automation	
III	**Managing and Optimizing Cloud Resources with Microsoft Azure: An Introduction to Azure Services and Resource Management Tools:** A. **Introducing Microsoft Azure:** Microsoft Azure Services, Subscriptions, Staying current with Azure. B. **Exploring Azure Resource Manager:** Introduction to Azure resource manager, Azure regions, Azure Management tools, Azure CLI on desktop	**A. U, R** **B. U, R**
IV	**Building and Managing Scalable Infrastructure on Microsoft Azure: Storage Solutions and Network Topology:** **A. Managing Storage in Azure:** Azure storage data types, working with storage account, Azure disk storage B. **Planning Network Topology:** Understanding network components, creating virtual networks, configuring virtual networks, connecting virtual networks, deploying azure firewall, virtual private networks and gateways	**A. U, R** **B. U, R**
V	**Deploying and Managing Virtual Machines on Microsoft Azure: Best Practices for Configuration, Cost Optimization, and Scalability:** **A. Deploying and Configuring Azure Virtual Machines:** Planning VM deployment, recognising Azure VM components, Architectural Considerations, cost saving opportunities, deploying Azure VMs from Azure Marketplace, Configuring VMs, Starting, stopping and resizing VMS, Using Azure virtual desktop.	**A. U, R**

Learning Outcomes:

After completion of the course students are supposed to be able to:

1. Apply knowledge of distributed system models and technologies to design scalable computing solutions for internet-based systems.
2. Demonstrate proficiency in designing and managing computer clusters, including job/resource management and virtualization techniques.
3. Utilize Microsoft Azure services effectively, including Azure Resource Manager, for resource provisioning and management.
4. Manage storage in Azure by understanding different storage types and effectively working with storage accounts.
5. Successfully deploy and configure Azure virtual machines, considering architectural considerations, cost-saving opportunities, and utilizing Azure virtual desktop.

Books and References:

1. Hwang, K., Fox, G. C., & Dongarra, J. J. (2009). Distributed and cloud computing: From parallel processing to the internet of things. Elsevier.
2. Erl, T. (2013). Cloud computing: Concepts, technology & architecture (1st ed.). Prentice Hall.
3. Buyya, R., Vecchiola, C., & Selvi, S. T. (2013). Mastering cloud computing: Foundations and applications programming (1st ed.). McGraw-Hill.
4. Erl, T., Mahmood, Z., & Arenas, R. P. (2013). Cloud computing design patterns (1st ed.). Prentice Hall.
5. Smith, J. E., & Nair, R. (2005). Virtual machines: Versatile platforms for systems and processes (1st ed.). Morgan Kaufmann.
6. Lazić, B. (2012). Cloud computing for science and engineering (1st ed.). Wiley.
7. Mahadevan, B., Vaidhyasubramaniam, S., & Balasubramanian, K. (2022). Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**20**	**30**	**10**	**10**	**5**	**25**	**100%**

MCCSCT304 Data Science Fundamentals

B. Sc (Computer Applications)		**Semester – VI**		
Course Name: Data Science Fundamentals		**Course Code: MCCSCT304**		
Vertical:		**Minor**		
Periods per week (1 Period is 60 minutes)		**03**		
Practical per week (1 Period is 60 minutes)		**02**		
Credits		**04**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**40**	**16**
	End Semester Examination	**2**	**60**	**24**
Practical	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Objectives of the Course:

1. Learn data science concepts, machine learning, deep learning, and data analysis techniques for real-world applications.
2. Understanding data exploration, visualization, and statistical analysis to derive insights.
3. Covers classification, regression, clustering, and anomaly detection.
4. Deep learning, recommendation systems, text mining, and time series forecasting for real-world problem-solving.
5. Provides practical exposure to real-world data science applications and develops problem-solving skills.

Module	Name	Lectures

I	Introduction to Data Science	09
II	Classification & Regression Methods	09
III	Clustering, Model Evaluation & Text Mining	09
IV	Deep Learning, Recommendation Engines & Anomaly Detection	09
V	Time Series Forecasting, Feature Selection & RapidMiner	09
		45

R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR – Create

Unit/ Module	**Syllabus As per SSC framework of NEP**	**Level of Knowledge Applicable as per Blooms Taxonomy**
I	**Introduction to Data Science** A. **Introduction** :AI, Machine Learning, And Data Science, What Is Data Science? Extracting Meaningful Patterns Building Representative Models, Combination Of Statistics, Machine Learning, And Computing, Learning Algorithms, Associated Fields. Case For Data Science: Volume, Dimensions, Complex Questions. Data Science Classification, Data Science Algorithms B. **Data Science Process** : Prior knowledge: objective, subject area, data, causation versus correlation. C. **Data Exploration** : Objectives of data exploration, datasets, descriptive statistics, data visualization: univariate visualization, multivariate visualization	A. R, U B. R, U, A, AN C. R, U, A, AN
II	**Classification & Regression Methods** A. **Classification:** Decision Trees, Rule Induction, K-Nearest Neighbors, Naïve Bayesian, Artificial Neural Networks , Support Vector Machines : How It Works, How to Implement, Conclusion. B. **Regression Methods:** Linear Regression, Logistic Regression, C. **Association Analysis:** Mining Association Rules, Apriori Algorithm, Frequent Pattern-Growth Algorithm.	A. R, U, A, AN B. R, U, A, AN C. R, U, A, AN
III	**Clustering, Model Evaluation & Text Mining** A. **Clustering :** Clustering to describe the data, Clustering for preprocessing, Types of Clustering techniques: K-Means Clustering, DBSCAN Clustering, Self-Organizing Maps. B. **Model Evaluation** : Confusion Matrix, ROC AND AUC, Lift Curves. C. **Text Mining** : Term Frequency-Inverse Document Frequency, how to implement, conclusion	A. R, U, A,AN B. R, U, A, AN, EV C. R, U, A, AN
IV	**Deep Learning, Recommendation Engines & Anomaly Detection**	

	A. **Deep Learning** : The AI Winter: Regression Models As Neural Networks, Gradient Descent, Need for Backpropagation, Classifying More Than 2 Classes: Softmax, Convolutional Neural Networks, Dense Layer, Dropout Layer, Recurrent Neural Networks, Autoencoders, Related AI Models. B. **Recommendation Engines** : Why do we need recommendation engines?, applications of recommendation engines, recommendation engine concepts, Collaborative Filtering, Content-Based Filtering, Hybrid Recommenders. C. **Anomaly Detection** : Causes of Outliers, Anomaly Detection Techniques: Outlier Detection Using Statistical Methods, Outlier Detection Using Data Science, Distance-Based Outlier Detection, Density-Based Outlier Detection, Local Outlier Factor.	A. R, U, A B. R, U, A, AN C. R, U, A, AN
V	**<u>Time Series Forecasting, Feature Selection & RapidMiner</u>** A. **Time Series Forecasting** : Time series decomposition, smoothing based methods: simple forecasting methods, exponential smoothing. Regression based methods: regression with seasonality, autoregressive integrated moving average, seasonal ARIMA. Machine learning methods: windowing, neural network autoregressive. Performance evaluation: validation dataset, sliding window validation. B. **Feature Selection** : Classifying feature selection methods, Principal Component Analysis, Information Theory-Based Filtering, Chi-Square-Based Filtering, Wrapper-Type Feature Selection**.** C. **RapidMiner** : User Interface And Terminology, Data Importing And Exporting tools, Data Visualization tools, Data Transformation tools, Optimization tools**.**	A. R, U, A B. R, U, A, AN C. R, U, A, AN

Data Science Fundamentals – Practical		
Sr. No.	**List of Practicals**	**Level of Knowledge Applicable as per Blooms Taxonomy**
1.	Data Exploration and Visualization Explore a dataset (e.g., Titanic, Iris, or a custom dataset) using descriptive statistics and visualize it.	R, U, A
2.	Classification Using Decision Trees	R, U, A, AN
3.	K-Means Clustering	R, U, A, AN, EV
4.	Regression Analysis	R, U, A, AN, EV
5.	Association Rule Mining	R, U, A, AN
6.	Deep Learning: Image Classification with CNNs	R, U, A, AN, EV
7.	Recommendation System	R, U, A, AN, EV
8.	Time Series Forecasting	R, U, A, AN, EV
9.	Anomaly Detection	R, U, A, AN, EV
10.	Text Mining	R, U, A, AN, EV

Practical can be performed using Python/ R

Learning Outcomes: After completion of Course, the learners will be able to:

1. Understand data science fundamentals, processes, and exploration techniques to analyse and visualize data effectively.
2. Apply classification, regression, and association analysis techniques to build predictive models and discover data patterns.
3. Implement clustering techniques, evaluate model performance, and apply text mining methods for data analysis.
4. Understand deep learning concepts, build recommendation systems, and apply anomaly detection techniques for data-driven insights.
5. Perform time series forecasting, apply feature selection techniques, and utilize RapidMiner for data analysis and modelling.

Books & References:

1. Vijay Kotu, Bala Deshpande, Data Science: Concepts and Practices, Morgan Kaufmann Publishers, Second edition, 2019.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, Fundamentals of Data Science, 1st Edition, 2022.
3. Daimi, Kevin, Ed. Hamid R. Arabnia, Principles of Data Science, Springer, 2020.
4. D J Patil, Hilary Mason, Mike Loukides, Ethics and Data Science, O' Reilly, 1st edition, 2018
5. Sinan Ozdemir, Principles of Data Science, Packt Publishing, December 2016
6. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press, 2014.
7. Cielen, Davy, Arno DB Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and more, using Python Tools, Manning Publications Co., 2016
8. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). *An Introduction to Statistical Learning: With Applications in R* (2nd ed.). Springer.
9. Aggarwal, C. C. (2015). *Data Mining: The Textbook*. Springer.
10. Box, G. E. P., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015). *Time Series Analysis: Forecasting and Control* (5th ed.). Wiley.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	20	25	20	20	10	05	100%

MCCSCT315 IT Service Management

Bachelor of Computer Applications		**Semester – VI**		
Course Name: IT Service Management		**Course Code: MCCSCT315**		
Vertical:		**VSEC**		
Periods per week (1 Period is 60 minutes)		**02**		
Credits		**02**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course Objectives:

1. Understand the fundamentals of IT service management and the ITIL 4 framework.
2. Explore the various management practices in ITIL, including general management, service management, and technical management.
3. Develop an understanding of driving stakeholder value and creating value for stakeholders.
4. Gain knowledge of creating, delivering, and supporting services within the ITIL service value system.
5. Explore the concept of High-Velocity IT and the importance of continual improvement.

Module	Name	Lectures
1.	**The ITIL Service Value System and Its Four Dimensions of Service Management**	**6**
2.	**ITIL management practices**	**6**
3.	**Drive Stakeholder Value**	**6**
4.	**Value Streams in Service Management: Creating, Delivering, and Supporting New Services**	**6**
5.	**High-Velocity IT and continual improvement**	**6**
	Total	**30**

R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create

Unit	Syllabus	Level of Knowledge Applicable as per Blooms Taxonomy
I	**The ITIL Service Value System and Its Four Dimensions of Service Management:** **A. Introduction**: IT service management in the modern world, About ITIL 4, the structure and benefits of the ITIL 4 framework. **B. Key concepts of service managemen**t: Value and value co-creation, Organizations, service providers, service consumers, and other stakeholders, Products and services, Service relationships, Value: outcomes, costs, and risks. **C. The four dimensions of service management**: Organizations and people, Information and technology, Partners and suppliers, Value streams and processes, External factors. **D. The ITIL service value system:** Service value system overview, Opportunity, demand, and value, The ITIL guiding principles, Governance, Service value chain, Continual improvement.	**A. U, R, AN** **B. U, R, AN** **C. U, R, AN** **D. U, R, AN**

II	**ITIL management practices:** **A. ITIL management practices:** General management practices, Service management practices, technical management practices.	**A.U, AN, EV**
III	**Drive Stakeholder Value:** **A. Drive Stakeholder Value:** Introduction, the customer journey, Step 1: Explore, Step 2: Engage, Step 3: Offer, Step 4: Agree, Step 5: Onboard, Step 6: Co-create, Step 7: Realize.	**A. U, R, AN**
IV	**Value Streams in Service Management: Creating, Delivering, and Supporting New Services:** **A. Create, Delivery and Support (CDS):** Service value system key concepts and challenges, using a shift-left approach, Plan and manage resources in the service value system, The use and value of technology across the service value system. **B. Value streams for new services**: Reviewing service value chains and service value streams, ITIL practices and value streams for new services, Change enablement, Service design and software development and management, Service validation and testing, Release management and deployment management **C. Value streams for user support**: ITIL practices and value streams for user support, Service desk, Incident management, Problem management, Knowledge management, Service level management, Monitoring and event management. **D. How to create, deliver and support services**	**A. U, R, AN** **B. U, R, EV** **C.U, R, AN** **D. U, R, AN**
V	**High-Velocity IT and Continual improvement:** **A. High-Velocity IT**: Introduction, Key concepts, culture, techniques, Continual improvement.	**A. U, R, AN**

Books and References:

1. Jouravlev, R., Anand, A., & et al. (2019). ITIL Foundation 4 Edition. TSO, AXELOS (2nd ed.).
2. Anand, A., Ashby, D., & et al. (2020). ITIL 4 High-Velocity IT. TSO, AXELOS (1st ed.).
3. Agutter, C. (2021). ITIL 4 Create, Deliver and Support (CDS). AXELOS (1st ed.).
4. Jouravlev, R., Demin, P., & et al. (2020). ITIL 4 Drive Stakeholder Value. TSO, AXELOS (1st ed.).

5. Anand, A., Corona, M., & et al. (2020). ITIL 4 Direct, Plan and Improve. TSO, AXELOS (1st ed.).
6. McDonald, M., & Kuhl, M. (2021). ITIL 4 Managing Professional: Creating, Delivering and Supporting Services. TSO, AXELOS (1st ed.).

Learning Outcomes:

1. Apply the principles and concepts of ITIL 4 to enhance IT service management practices.
2. Demonstrate proficiency in implementing ITIL management practices.
3. Successfully drive stakeholder value and engage in value co-creation.
4. Develop the skills to create, deliver, and support services within the ITIL service value system.
5. Understand the principles and techniques of High-Velocity IT and foster a culture of continual improvement.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**20%**	**20%**	**20%**	**10%**	**10%**	**20%**	**100%**

MCCSCT316 Cyber Laws and Patents

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Cyber Laws and Patents		**Course Code: MCCSCT316**		
Vertical:		**VSEC**		
Periods per week (1 Period is 60 minutes)		**02**		
Credits		**02**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course Objectives:

1. Critically analyze the power of arrest without a warrant under the IT Act, 2000 and its implications.
2. Understand the legal aspects of contracts in the Infotech world and jurisdiction in the cyber world.

3. Explore the battle against cyber squatters, copyright protection, and the legal issues surrounding content on the internet.
4. Examine the challenges and complexities of e-commerce taxation in the virtual world and the role of digital signatures, certifying authorities, and e-governance.
5. Gain knowledge of the legal aspects related to electronic records as evidence, the protection of cyber consumers, and the amendments in the Indian IT Act, 2000.

Module	Name	Lectures
I.	**Arrest Powers and Cyber Crime Legal Procedures under the IT Act, 2000**	**6**
II.	**Legal Issues in Infotech Contracts and Cyber Jurisdiction**	**6**
III.	**Combating Cyber Squatting and Ensuring Copyright Protection in the Digital World.**	**6**
IV.	**Taxation in E-Commerce and Digital Signatures in E-Governance**	**6**
V.	**Electronic Evidence and Cyber Consumer Protection in India**	**6**
	Total	**30**

R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create

Unit	Syllabus	Level of Knowledge Applicable as per Blooms Taxonomy
I	**Arrest Powers and Cyber Crime Legal Procedures under the IT Act, 2000:** A. **Power of Arrest Without Warrant Under the IT Act, 2000:** A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for "About to Commit" an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment! B. **Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:** Concept of "Cyber Crime " and the IT Act , 2000, Hacking,	**A. U, R, AN** **B. U, R, AN**

	Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.	
II	**Legal Issues in Infotech Contracts and Cyber Jurisdiction:** A. **Contracts in the Infotech World:** Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts. B. **Jurisdiction in the Cyber World:** Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.	**A. U, AN, EV** **B. U, R, AN**
III	**Combating Cyber Squatting and Ensuring Copyright Protection in the Digital World:** A. **Battling Cyber Squatters and Copyright Protection in the Cyber World:** Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	**A. U, R, AN**

IV	**Taxation in E-Commerce and Digital Signatures in E-Governance:** **A. E-Commerce Taxation: Real Problems in the Virtual World:** A Tug of War on the Concept of 'Permanent Establishment', Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance. **B. Digital Signature, Certifying Authorities and E-Governance:** Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	**A. U, R, AN** **B. U, R, EV**
V	**Electronic Evidence and Cyber Consumer Protection in India:** **A. The Indian Evidence Act of 1872 v. Information Technology Act, 2000:** Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934. **B. Protection of Cyber Consumers in India:** Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber-Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000.	**A. U, R, AN** **B. U, R, AN**

Books and References:

1. Sood, V. (2001). Cyber Law Simplified. TMH Education.
2. Kosseff, J. (2017). Cybersecurity Law. Wiley.
3. Tittel, E., & Hane, P. (2019). Cyber Law: A Legal and Ethical Guide to the Internet and the Law. Pearson Education.
4. Raman, M. (2014). Cyber Laws and E-Commerce. PHI Learning Pvt. Ltd.
5. Chauhan, P., & Chauhan, V. (2013). Cyber Laws in India: A Comprehensive Guide. S. Chand Publishing.
6. Banisar, D., & Davies, S. (2001). Internet and Online Law: A Guide for the Internet Business. BNA Books.

Learning Outcomes: After completion of the course students are supposed to be able to:

1. Evaluate the provisions and limitations of the power of arrest without a warrant under the IT Act, 2000 and its impact on individuals' rights.
2. Apply the legal principles governing contracts in the Infotech world and understand the jurisdictional issues in the cyber world.
3. Analyze the strategies and legal measures against cyber squatters, copyright infringement, and protection of content on the internet.
4. Assess the challenges and implications of e-commerce taxation in the virtual world and understand the role of digital signatures, certifying authorities, and their impact on e-governance.
5. Demonstrate understanding of the legal requirements for electronic records as evidence, the protection of cyber consumers, and the amendments in the Indian IT Act, 2000.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**20%**	**20%**	**20%**	**10%**	**10%**	**20%**	**100%**

MCCSCT229 Introduction to Robotic Process Automation

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Introduction to Robotic Process Automation		**Course Code: MCCSCT229**		
Vertical:		**VSEC**		
Periods per week (1 Period is 60 minutes)		**02**		
Credits		**02**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Theory	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**9**

Course Objectives:

1. Develop foundational skills in creating automation projects using UiPath across different project types, including sequence-based, flowchart-based, and recording-based projects, ensuring proficiency in project creation and workflow design.
2. Gain practical experience in automating numerical calculations, managing various types of variables, and implementing decision statements and looping structures within UiPath projects, enabling efficient process automation and data manipulation.
3. Acquire expertise in utilizing UiPath recording capabilities for automating processes across different environments, such as desktop, web, and basic recording, fostering proficiency in recording-based automation techniques.
4. Master advanced UiPath functionalities, including handling Excel operations, working with different control elements, implementing event triggers, screen scraping methods, and integrating with external plugins and applications, enabling students to build robust and versatile automation solutions for complex business processes.

List of Practical:		**Level of Knowledge Applicable as per Blooms Taxonomy**
1.	a. Create a simple sequence based project.	U,A,EV,CR
	b. Create a flowchart-based project.	U,A,EV,CR
	c. Create an UiPath Robot which can empty a folder in Gmail solely on basis of recording.	U,A,EV,CR
2.	a. Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers).	U,A,EV,CR
	b. Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table)	U,A,EV,CR
3.	a. Create an automation UiPath Project using decision statements.	U,A,EV,CR
	b. Create an automation UiPath Project using looping statements.	U,A,EV,CR
4.	a. Automate any process using basic recording.	U,A,EV,CR
	b. Automate any process using desktop recording.	U,A,EV,CR
	c. Automate any process using web recording.	U,A,EV,CR
5.	a. Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed.	U,A,EV,CR
6.	a. Create an application automating the read, write and append operation on excel file.	U,A,EV,CR
	b. Automate the process to extract data from an excel file into a data table and vice versa	U,A,EV,CR
7.	a. Implement the attach window activity.	U,A,EV,CR
	b. Find different controls using UiPath.	U,A,EV,CR
	c. Demonstrate the following activities in UiPath: i. Mouse (click, double click and hover) ii. Type into iii. Type Secure text	U,A,EV,CR

8.	a. Demonstrate the following events in UiPath: i. Element triggering event ii. Image triggering event iii. System Triggering Event	U,A,EV,CR
	b. Automate the following screen scraping methods using UiPath i. Full Test ii. Native iii. OCR	U,A,EV,CR
	c. Install and automate any process using UiPath with the following plug-ins: i. Java Plugin ii. Mail Plugin iii. PDF Plugin iv. Web Integration v. Excel Plugin vi. Word Plugin vii. Credential Management	U,A,EV,CR
9.	a. Automate the process of send mail event (on any email).	U,A,EV,CR
	b. Automate the process of launching an assistant bot on a keyboard event.	U,A,EV,CR
	c. Demonstrate the Exception handing in UiPath.	U,A,EV,CR
	d. Demonstrate the use of config files in UiPath.	U,A,EV,CR
10.	a. Automate the process of logging and taking screenshots in UiPath.	U,A,EV,CR
	b. Automate any process using State Machine in UiPath.	U,A,EV,CR
	c. Demonstrate the use of publish utility.	U,A,EV,CR
	d. Create and provision Robot using Orchestrator.	U,A,EV,CR

Learning Outcomes: After completion of Course, the learners will be able to:

1. Recall the fundamental concepts of UiPath automation, including sequence-based and flowchart-based project structures, as well as the basic functionalities of UiPath recording for desktop, web, and generic automation tasks.
2. Understand the principles of variable types and decision-making structures within UiPath automation projects, comprehending the significance of different control elements and their applications in diverse automation scenarios.
3. Apply the acquired knowledge of UiPath functionalities to create and execute automation projects that involve numerical calculations, data manipulation using different variable types, and implementation of decision statements and looping structures.
4. Analyze complex automation scenarios and select appropriate UiPath recording methods based on the nature of the process, evaluate different event triggers and screen scraping methods, and assess the suitability of integrating various plugins and external applications with UiPath for specific automation tasks.

Books and References:

1. Tripathi, A. M. (2018). Learning Robotic Process Automation (1st ed.). Packt Publishing.

2. Merianda, S. (2018). Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation (1st ed.). Createspace Independent Publishing.
3. Wibbenmeyer, K. (2018). The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization (1st ed.). iUniverse.
4. Avasarala, V. (2019). Mastering Robotic Process Automation: A Complete Guide for Business and Technology Professionals (1st ed.). Wiley.
5. Manohar, S. (2020). Robotic Process Automation: A Complete Guide to RPA Implementation (1st ed.). McGraw-Hill Education.
6. Lee, J. (2020). Robotic Process Automation with UiPath: Learn how to design and deploy RPA bots (1st ed.). Packt Publishing.

Percentage of 6 categories of Blooms Taxonomy in question paper

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**20**	**20**	**20**	**10**	**10**	**20**	**100%**

MCCSCT325 Mobile App Development

Bachelor of Computer Applications		**Semester – VI**		
Course Name: Mobile App Development		**Course Code: MCCSCT325**		
Vertical:		**VSEC**		
Periods per week (1 Period is 60 minutes)		**04**		
Credits		**02**		
Evaluation System		**Duration (in Hours)**	**Total Marks**	**Minimum Passing Marks**
Practical	**Continuous Internal Assessment**	**--**	**20**	**8**
	End Semester Examination	**2**	**30**	**12**

Course objective:

1. Understand the fundamental concepts and components of Android development, including activities, services, content providers, and broadcast receivers.
2. Gain proficiency in utilizing Android resources such as colors, themes, strings, drawables, and dimensions to enhance the visual aspects of an application.
3. Develop skills in programming activities and fragments, including understanding their life cycles and implementing multiple activities and fragments in an application.
4. Learn to design and implement different layouts, such as coordinate, linear, relative, table, absolute, frame, list view, and grid view, to create user interfaces in Android applications.
5. Explore and implement UI elements like app bars, fragments, and other UI components to enhance the user experience and interaction in Android applications.

List of Practical		**Level of Knowledge Applicable as per Blooms Taxonomy**
1.	Program to demonstrate the features of Dart language.	U,A,AN,CR
2.	Designing the mobile app to implement different widgets.	U,A,AN,CR
3.	Designing the mobile app to implement different Layouts.	U,A,AN,CR
4.	Designing the mobile app to implement Gestures.	U,A,AN,CR
5.	Designing the mobile app to implement the theming and styling.	U,A,CR
6.	Designing the mobile app to implement the routing.	U,A,CR
7.	Designing the mobile app to implement the animation.	U,A,AN,CR
8.	Designing the mobile app to implement the state management.	U,A,AN,CR
9.	Designing the mobile app working with SQLite Database.	U,A,AN,CR
10.	Designing the mobile app working with Firebase.	U,A,AN,CR

Learning Outcomes: After completion of the course students are supposed to be able to:

1. Develop a solid understanding of Android application development and the Android Studio IDE, enabling the creation of basic Android projects and the utilization of essential Android components.
2. Apply Android resources effectively, including colors, themes, strings, drawables, and dimensions, to enhance the visual appeal and customization of Android applications.

3. Demonstrate proficiency in programming activities and fragments, including managing their life cycles, implementing multiple activities, and effectively utilizing fragments in Android applications.
4. Design and implement diverse layouts, such as coordinate, linear, relative, table, absolute, frame, list view, and grid view, to create visually appealing and user-friendly interfaces in Android applications.
5. Implement various UI elements, such as app bars, fragments, and other UI components, to enhance user interaction and provide a seamless user experience in Android applications.

Books and References :

1. Sharma, R. (2020). Android App Development for Beginners: A Hands-On Guide to Creating Your First Android Application (1st ed.). Packt Publishing.
2. Gaddis, T. (2019). Android Programming: The Big Nerd Ranch Guide (4th ed.). Big Nerd Ranch.
3. Meier, R. (2018). Professional Android (4th ed.). Wrox.
4. O'Reilly, K. (2019). Flutter for Beginners: An Introduction to Building Cross-Platform Mobile Apps (1st ed.). Packt Publishing.
5. Goyal, N., & Ghosh, S. (2020). Mastering Android Development with Kotlin (1st ed.). Packt Publishing.
6. Wright, A. (2020). Building Mobile Apps with Flutter: Learn to Build Beautiful, High-Performance Mobile Applications for iOS and Android (1st ed.). Apress.

	Remember	Understand	Apply	Analyze	Evaluate	Create	
% in Question Paper	**20**	**20**	**20**	**10**	**10**	**20**	**100%**

MCCSCTPRJ402 CAPSTONE Project

Bachelor of Computer Applications	**Semester – VI**	
Course Name: CAPSTONE Project	**Course Code: MCCSCTPRJ402**	
Vertical	**RP / OJT**	
Periods per week (1 Period is 50 minutes)	**3**	
Credits	**4**	
	Hours	**Marks**

Evaluation System	**Presentation and Viva**	**3**	**100**

The details are given in CAPSTONE Project Policy document.

Evaluation Scheme

The Exam for the students in this programme will be held under four heads

- Continuous Internal Assessment
- End Semester Examination
- Practical Continuous Internal Examination
- Practical End Semester Examination

1. **Internal Evaluation (40 Marks).**
   i. **Test: 1 and Test 2: Class test of 20 marks. (Can be taken online)**

Q	Attempt ***any four*** of the following:	20
a.		
b.		
c.		
d.		
e.		
f.		

2. **End Semester Examination: (60 marks)**

	All questions are compulsory	
Q1	(Based on Unit 1) Attempt ***any two*** of the following:	12
a.		
b.		
c.		
d.		
Q2	(Based on Unit 2) Attempt ***any two*** of the following:	12
Q3	(Based on Unit 3) Attempt ***any two*** of the following:	12
Q4	(Based on Unit 4) Attempt ***any two*** of the following:	12
Q5	(Based on Unit 5) Attempt ***any two*** of the following:	12

3. **End Semester Examination: (30 marks)**

	All questions are compulsory	
Q1	(Based on Unit 1) Attempt ***any one*** of the following:	6
a.		
b.		
Q2	(Based on Unit 2) Attempt ***any one*** of the following:	6
Q3	(Based on Unit 3) Attempt ***any one*** of the following:	6
Q4	(Based on Unit 4) Attempt ***any one*** of the following:	6
Q5	(Based on Unit 5) Attempt ***any one*** of the following:	6

4. **Practical End Semester Examination**

Note: Certified Copy of Journal is mandatory for appearing for the practical exam.

1.	Practical Question 1	15
2.	Practical Question 2	15

OR

1.	**Practical Question**	**30**

For Tutorial Exam, a paper of 30 marks to be solved.

General Elective / Open Elective will have continuous internal assessment of 50 marks. The assessment shall be based on Assignments / Tests / Presentations/ Role plays and similar activities.