Shri Swami Vivekanand Shikshan Sanstha's

Vivekananda College Kolhapur, (An Empowered Autonomous Institute)

Department of BCA

Syllabus according to NEP 1.0 w.e.f July 2023

For the Academic year 2025-2026

STRUCTURE OF COURSE

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
Semester-V										
1	DSC-IX	DSC04COM51	ASP.NET with C#	2	-	40	10	-	50	2
2	DSC-X	DSC04COM52	Cloud Computing	2	-	40	10	-	50	2
3	DSC-XI	DSC04COM53	Linux	2	-	40	10	-	50	2
4	DSC-XII	DSC04COM54	Software Project Management	2	-	40	10	-	50	2
5	DSE-IA	DSE04COM51	Python	2	-	40	10	-	50	2
	DSE-IB	DSE04COM52	Android Programming							
6	SEC-VI	SEC04COM51	Cyber Security-I	2	-	50	-	-	50	2
7	FP-I	FPR04COM51	On Job Training	-	4	-	-	50	50	2
8	DSC-PR-IX	DSC04PRA59	DSCComputerLab-5A (ASP.NET with C# & Python)		8			100	100	4
9	DSC-PR-X	DSC04PRB59	DSCComputerLab-5B (Linux & Cloud Computing		8			100	100	4
Total (Semester-V)				**12**	**20**	**250**	**50**	**250**	**550**	22
Semester-VI										
1	DSC-XIII	DSC04COM61	Java Programming	2	-	40	10	-	50	2
2	DSC-XIV	DSC04COM62	Data Warehousing and Data Mining	2	-	40	10	-	50	2
3	DSC-XV	DSC04COM63	Computer Networking	2	-	40	10	-	50	2
4	DSC-XVI	DSC04COM64	MySQL	2	-	40	10	-	50	2
5	DSE-IIA	DSE04COM61	R Programming	2	-	40	10	-	50	2
	DSE-IIB	DSE04COM62	Internet of Things							
6	SEC-VII	SEC04COM61	Cyber Security-II	2	-	50	-	-	50	2
7	OJT-I	OJT04COM61	Field Project	-	4	-	-	50	50	2
8	DSC-PR-XI	DSC04PRA69	DSCComputerLab-6A (Java Programming & MySQL)		8			100	100	4
9	DSC-PR-XII	DSC04PRB69	DSCComputerLab-6B (Computer Networking & R Programming)		8			100	100	4
Total (Semester-VI)				**12**	**20**	**250**	**50**	**250**	**550**	**22**
Cumulative Total (3rd Year)				**24**	**40**	**500**	**100**	**500**	**1100**	**44**

Nature of Theory Question paper:

QUESTION PAPER PATTERN FOR SEMESTER V & VI

Total Marks-40 **Duration- 2 Hrs**

Instructions:

1. All questions are compulsory.
2. Figures to right indicate full marks.

Q1.A. MCQ	-5 marks
B. Fill in tne blanks / Match the pair / True false	-3 marks
Q2. Long answer questions / Brief answer questions (Solve any 2 out of 3)	- 16 marks
Q3. Short Note (Solve any four out of five)	- 16 marks

Internal evaluation

Total Marks- 10 **(Test- 3 marks, Home Assignment-3 marks, Dept.Activities-02 marks, Oral-02 marks)**

Semester V

Course Code: DSC04COM51	Course Name: ASP.NET with C#	Credits: 02	Marks : 40

Course Outcomes	**After the successful completion of the course the students are able to-** CO1.Understand Web server, HTTP request response architecture. CO2.Learn Web forms and their controls. CO3.Learn state management in web forms. CO4.Understand ADO.NET Architecture with connection oriented and Disconnected layer.

Module	Descriptions	Teaching Hrs.
I	**Introduction to .Net:** An Overview of C#, History and Features of C#, .NET Framework Architecture, IDE – (Integrated Development Environment), Components of .NET: CLR, CLS, Microsoft Intermediate Language ("MSIL" or "IL"), The Common Type System (CTS), Data Types, Value and Reference Types, C# - Flow Control: Branching and Looping, Type casting, Boxing and Unboxing, JIT compiler and it's types, .DLL and .EXE	7
II	**Object Oriented Concepts** Object Oriented Concepts: Classes and Objects, Command Line Arguments, Polymorphism, Inheritance and it's types- Single, Multiple, Multilevel, Hierarchical, Parameter Passing Mechanism – 'val' and 'ref', Abstract Classes, Sealed Classes, Partial Classes, Exception Handling	7
III	**Introduction to ASP.NET** Introduction to Scripting Languages, ASP.NET Introduction, Features of ASP.NET, Web browser and web server, HTTP request response structure, HTML form elements, GET/POST method, Client side and Server side programming, Web form life cycle, Page events, Server Controls: Textbox, List controls, File Upload, Link button, Image map, Image, Image button, Calendar, Literal control, Radio button, Checkbox, Validation Controls, Navigation controls, Master Page.	8
IV	**State Management and Database Connectivity** State Management: Cross page post back property of button, Response. Redirect, Server. Transfer, Response. Write, State Management - Session, Application, Global. Sax, Caching. Database Connectivity: SqlServer Database, Data controls- Grid view, List view , Form View, Details View, Repeater, Introduction to ADO.Net, ADO.NET Architecture- Connection, command, data reader, data adapter, data set, Understanding connected layer of ADO.NET and disconnected layer of ADO.NET.	8
	Books Recommended: 1. Beginning ASP.NET 4.5 in C# and VB, Wrox, 2012, ISBN-10: 1118311809 2. Beginning ASP.NET 4.5 in C#, Apress, 2012, ISBN-10: 1430242515 3. Pro C# with .NET 3.0, Andrew Troelsen, Apress, 2007, ISBN 978-1-59059-823-8	

Course Code: DSC04COM52	Course Name: Cloud Computing	Credits: 02	Marks : 40
Course Outcomes	**After the successful completion of the course the students are able to-** CO1. Understand the fundamental principles of Cloud Computing. CO2. Understand the importance of virtualization in distributed computing and how this has enabled. CO3. Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies. CO4. Implement different types of Virtualization technologies and Service Oriented Architecture systems.		

Module	Descriptions	Teaching Hrs.
I	**Introduction to Cloud Computing** 1.1 Introduction 1.2 Roots of Cloud Computing 1.3 Layers and Types of Cloud 1.4 Desired Features of a Cloud 1.5 Platform as a Service Providers 1.6Architecture of cloud computing 1.7Challenges in the cloud 1.8 Types of Cloud : Private, Public, Hybrid	7
II	**Virtualization** 2.1 Introducing virtualization and its benefits 2.2 Implementation Levels of Virtualization 2.3 Virtualization at the OS Model 2.4 Virtualization Structure: Hosted Structure, Bare-Metal 2.5 Structure Virtualization of CPU,Memory, and I/O Devices 2.6 Virtualization in Multicore Processors 2.7 Virtual Clusters and Resource management	7
III	**Cloud Computing Services** 3.1 Infrastructure as a Service 3.2 Platform as a servive 3.3 Leveraging PaaS for productivity 3.4 Guidelines for selecting PaasPovider 3.5 Concern with PaaS 3.6 Language and PaaS 3.7 Software as a Servive 3.8 Database as a Service 3.9 Specialized Cloud Services	8
IV	**Cloud Computing Applications** 4 4.1 Business Applications: MailChimp, Salesforce, Chatter,Paypal 4.2 Education Applications:Google Apps for 4.3 Education,Chromebooks for Education,Tablets with Google Play for Education 4.4 Entertainment Applications:Online games, Video Conferencing Apps, 4.5 Social Applications:Facebook, Twitter, LinkedIn	8
	Books Recommended: 1.Cloud Computing : Principles and Paradigm- Rajkumar Buyya, James Broberg, Andrzej Goscinski, Willey Publication 2. Cloud Comuting : Black Book- Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr.Deven Shah 3. Cloud Computing : Bible- Barrie Sosinsky, Willey Publication 4. Cloud Computing : A Hands-On Approach- Arshdeep Bahga, Vijay Madisetti	

Course Code: DSC04COM53	Course Name: Basic Linux	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to-** CO1.Understand the working and use of NANO editor. CO2.Learn Regular expressions using meta characters. CO3.Learn filters with the help of regular expression. CO4.Learn advanced BASH shell Programming.		

Module	Descriptions	Teaching Hrs.
I	**Introduction to Linux, File System and System Calls** Introduction to Linux: Operating System Basics, History of Linux, Architecture of Linux, Operating System Services, Shell, Types of Shell, Kernel, Login and Logout, General Purpose Utilities (banner, cal, date, calendar, who, tty, uname, password, lock, echo, tput, bc, clear, script, wc, echo, test, expr), Finding Information of commands. File System: File system terminology, A Hierarchical file system, Boot block, Super block, I node table, Storage and Accessibility of files, File and Directory Manipulation commands (pwd, cd, ls, mv, cp, rm, mkdir, rmdir, cat) File ownership and permission, File system commands, File locating command (find), File permissions. System Calls: Open, Read, Write, Close	7
II	**Process and BASH Shell Scripting** BASH Shell Scripting: Introduction of Shell Scripts, Variable and Invoking the Shell Variables, Operators (Arithmetic, Relational, Logical, Assignment, Reassignment), Special Variables ($*, $@, $1-$9, $?, $!, $$, $-), Control Statement- Conditional, Selection statements, Looping statements.	7
III	**Memory Management, NANO Editor and Regular Expressions** Memory Management: Swapping, Demand Paging, Paging, and Segmentation. NANO Editor: Installing the Nano Text Editor in Linux, Nano Command Keys, Create a New File using Nano, Open an Existing File Using Nano, Edit Files Using Nano Text Editor in Linux, Cut and Paste Lines of Text Using Nano, Valid Shortcuts in Nano Text Editor, Search Text Using Nano, Spell Check Using Nano, Save Your Work Using Nano, Save with Backups. Regular Expressions: Met characters, Controlling Repeated Characters through *, +, and ?, Using and Modifying the '.' Met character, Controlling Where a Pattern Matches, Matching from a List of Options, Matching Characters That Must Not Appear, Matching Met characters Literally, Controlling Repetition, Selecting between Sequences	8
IV	**Filters and Advanced BASH Shell Programming** **Filters:** cat, tac, head, tail filters and options, sed and sed options, grep and grep options, Line Addressing, Multiple Instruction(-E and -F), Context Addressing, Writing Selected Lines to a File. **Advanced BASH Shell Programming:** Seq Command for sequence, Shell and subshell, Exporting Shell Variables, Arrays, String Manipulation, Shell Functions.	8
	Books Recommended: 1. LINUX with Operating System Concepts by Richard Fox, CRC Press 2. Linux Commands- Instant Reference by Bryan PF affenberge 3. The Design of the Unix Operating System- Bach 4. Unix Shell Programming- Yashwant Kanetkar 5. Unix Concepts and Application – Sumitabhadas 6. Linux : The Complete Reference- Richard Peterson	

Course Code: DSC04COM54	Course Name: Software Project Management	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to -** CO1.To understands the fundamental principles of software project management. CO2.To be a good knowledge of responsibilities of project manager. CO3.To be familiar with the different methods and techniques used for project management. CO4.To gain knowledge of the key responsibilities of a project manager, such as leadership, communication, and resource allocation.		
Module	**Descriptions**		**Teaching Hrs.**
I	**Software Development Process and Models** **Introduction to Software Development Process**: Defining software development, tailoring processes, and improving process discipline. **Software Production Process**: Understanding the need for process discipline in software development. **Software Models**: Waterfall Model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, Component Assembly Model. **Software Life Cycle**: Overview of the stages and phases in the software development life cycle.		7
II	**Software Development and Project Management Software Development Team:** Roles and structure of the team, leadership and communication.Project Management: Top-Down and Bottom-Up Planning, Activity types, Project duration, and Schedule Monitoring **Tools (Gantt Chart, PERT Chart, Critical Path Method).**		7
III	**Project Review, Engineering, and Problem Solving** **Project Review and Tracking**: Importance of recovery plans, tracking meetings, and escalation meetings. **Project Engineering**: Product requirements, understanding customer needs, and investigation strategies. **Problem Solving Techniques**: Data Flow Diagrams, Data Dictionary, Structured English, Decision Trees, Decision Tables, Feasibility Study.		8
IV	**Software Testing and Quality Assurance Software Testing**: Test Plan, Verification & Validation, General Testing Methods (White Box, Black Box), Unit Testing, System Integration, and Validation Testing. **Software Quality**: Quality measures (FURPS), Software Quality Assurance (SQA), Reviews (FTR), and formal approaches like Clean		8
	Books Recommended: 1. "Software Engineering: A Practitioner's Approach" by Roger S. Pressman" 2. Software Engineering: Theory and Practice" by Shari Lawrence Pfleeger and Joanne M. Atlee 3. Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin 4. "The Art of Software Testing" by Glenford J. Myers		

Course Code: DSE04COM51	Course Name: Python	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to -** CO1.Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. CO2.Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. CO3.Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python. CO4.Identify the commonly used operations involving file systems and regular expressions.		
Module	**Descriptions**		**Teaching Hrs.**
I	**A.INTRODUCTION TO PYTHON** Installation, Spyder IDE, Python Interpreter, History Of Python, Python Features, Applications Of Python, Data Types, Types Of Operators, Operators Precedence, Expressions, Statements, Functions, Comment, Strings - Accessing Values In Strings, Updating Strings, Escape Characters, Built-In String Methods, User Input **B.CONTROL FLOW AND LOOPS** Conditionals: Boolean Values And Operators, Conditional (If), Alternative (If-Else) ,Chained Conditional (If-Elif-Else) Looping-While Loop, The Infinite Loop, For Loop, Iterating By Sequence Index, Using Else Statement With Loops, Nested Loops, Break, Continue & Pass Statement. Functions: Function With Arguments, Lambda Functions		**15**
II	**A.LISTS, TUPLES, DICTIONARIES AND SET** Lists-Create a List, Get and Set Items ,Add and Remove Items, List Slices, Different List Methods TUPLES - Creation and Accessing Values, Updating Tuples, Deleting Tuple Elements, Basic Tuples Operations, Indexing, Slicing DICTIONARY- Accessing Values in Dictionary, Updating Dictionary, Delete Dictionary Elements, Properties of Dictionary Keys, Built In Dictionary Functions and Methods. SETS -Concept of Sets, Creating, Initializing and Accessing the Elements, Sets Operation. **B.MODULES, FILES I/O,GUI** The Import Statement, Modules (Date time, Calendar, Math Module) Files I/O: Text Files, Reading And Writing Files Introduction To GUI In Python		**15**
	Books Recommended: 1. R. NageswaraRao, —Core Python Programming‖, Dreamtech 15 2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf. 3. Programming with python, A users Book, Michael Dawson, Cengage Learning 4. Python Programming: An Introduction to Computer Science Paperback – a. by John M Zelle. 5. Python Crash Course, 2nd Edition Paperback –by Eric Matthes.		

Course Code: DSE04COM51	Course Name: Android Programming	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to –** CO1.Understand the building blocks of Mobile Operating Systems CO2.Analyze different elements of Android Development Environment CO3.Illustrate the structure of Mobile Applications using Android CO4. Identify different components used in Mobile Applications using Android		
Module	**Description**		**Teaching Hrs.**
I	**Introduction to Mobile Operating System:** Mobile operating system, Operating system structure, Constraints and Restrictions, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features. Brief history of Android, Different types of mobile applications		**9**
II	**Android Development Environment :** Introduction to Mobile development IDE's, Setting up development environment, Android Software Development, Working with the AndroidManifest.xml, Dalvik Virtual Machine & .apk file extension, Android Architecture, Building a sample Android application using Android Studio. Android Project Structure, Working with emulator		**8**
III	**Android Application Framework :** Layouts & Drawable Resources, Basic Building blocks - Activities and Activity lifecycle, UI Components - Views & Notifications, Components for communication -Intents & type of Intents, Android API levels (versions & version names), Developing sample Application		**4**
IV	**Basic UI design:** Form widgets, Text Fields, Layouts, Option menu, Context menu, Sub menu, Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup, Introduction to SQLite Programming, SQLite Database.		**9**
	Books Recommended 1. AnubhavPradhan, Anil V Deshpande, — Mobile Apps Development‖ Edition:I 2. Teach Yourself Android Application Development In 24 Hours, Edition:I, Publication: SAMS 3. Jeff McWherter, Scott Gowell —Professional Mobile Application Development‖, John Wiley & Sons, 2012. 4. Barry Burd, —Android Application Development All in one for Dummies‖, Edition:I		

Course Code: SEC04COM51	Course Name: Cyber Security I	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to -** CO1.Understand importance of cyber security and security management. CO2.Learn different security threats. CO3.Understand cyber security laws and importance of security audit. CO4.Learn concept of wireless network security.		
Module	**Descriptions**		**Teaching Hrs.**
I	**Introduction to Cyber Security** Cyber Security: Definition, Importance, Computer ethics, Cyber Security Policy, Data Security, Mobile Device Security, User Security, File Security, Password Security, Browser Security, Email Security, Phishing Encryption, Decryption, Digital Signature, Firewall, Configuring, Windows Firewall.		7
II	**Types of Security and Security Management** Types of Security: Background and Current Scenario, Types of Attacks, DoS attack, Goals for Security, E-commerce Security, dimensions of E-commerce security, Security protocols, Computer Forensics, Steganography, **Security Management**- Overview of Security Management, Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices.		7
III	**Security Threats and Access Controls** Security Threats: Definition, Types of Threats - Virus, Worms, Trojan Horse, Malware, Ransomware, Identity theft etc, Torrent and infected websites, Antivirus-Definition, Types, features, advantages, limitations. Access Controls: Overview of Authentication and Authorization, Overview of Intrusion Detection Systems, Intrusion Detection Systems and Intrusion Prevention Systems.		8
IV	**Wireless Network Security** Wireless Network Security- Components of wireless networks, Security issues in wireless, Wi-Fi Security, Risk of Using Unsecured Wi-Fi, Bluetooth and its security, Firewall, types of firewall.		8
	Books Recommended: 1. Computer Network -AS Tannenbum 2. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyber war, Hacking) - Harry Colvin. 3. How NOT To Use Your Smartphone - Rodney D Cambridge. 4. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book -A.M. Perry. 5. Cyber Security Essentials- James Graham, Richard Howard, Ryon Olson		

On Job Training
Course Code: OJT04COM61
Marks: 50 Credit : 2

B.C.A Part – III
Semester – V Part- III
Lab Course based on ASP.Net with C# and Python
Theory: 00 Teaching Hours Credits – 4

Course Outcomes - At the end of this course students will be able to:

CO1. An ability to design implements and evaluate a computer-based system, process, component or program to meet desired needs.
CO2. An ability to use current techniques, skills and tools necessary for computing practice
CO3. To read and write simple ASP.Net programs.
CO4. Ability to explore ASP.Net especially the object oriented concepts and the built-in objects of python

ASP.Net with C#

Sr No.	Content
1	Accept your Name in TextBox1 and check it not greater than 10 character, print appropriate message using if.. else.. Accept Fee in TextBox2 and check Fee should be in number and >=16000
2	Write a console program to accept a single alphabet and convert it into lower if it is upper and vice versa
3	Write a Console Program to accept number from lower to limit to higher limit 10 numbers in integer array and print all the divisors of 12
4	Write a console program to convert entered days into years, weeks and days
5	Write a console program to calculate area of sphere by using function
6	Write a program to accept a lower or upper alphabet check it is vowel or consonant using switch Statement
7	Write a console program to declare and initialize as string ="Fox jump over the lazy dog" And count total words in the string.
8	Write a Console program to accept 5 integer numbers in an array and find sum and average of elements And then count total elements below average and above average
9	Write a console program to accept year and check it is leap or not.
10	Write a console program to accept 5 elements in an integer array and find minimum and maximum element in it.
11	Write a console program to write a function Add with 2 integer numbers as parameter having return type int and call it in Main() method to display sum of 2 numbers.
12	Create Employee form to accept EmpNO, Name, Designation, Salary. Using ADO create connectively to add records in database table Emp. Take 2 buttons Submit and Clear button
13	Write a console program to accept base and index as integer and find power(p= 23=8) without using built-in math functions

Python

Sr No.	Contnt
1	Write Python program to do arithmetical operations such as Addition, Subtraction, Multiplication and Division
2	Write Python program to display greatest number among three numbers.
3	Write Python program to display multiplication table of any number.
4	Write Python program to Find the Factorial of a given number.
5	Write Python program to reverse the given number using while loop.
6	Write Python program to generate Fibonacci series up to the given range using Function.
7	Write Python program to check the given string is palindrome or not.
8	Write Python program to do following operations on string: create, indexing, slicing, upper, lower, compare
9	Write Python program to create a python List and do following operations on List: append (), extend (), insert (), remove (), reverse (), len (), min () & max (), sort ()
10	Write Python program to create a python Tuple and do following operations on tuple: Concatenation, Repetition, Membership.

B.C.A Part – III

Semester – V Part- III

Lab Course based on Linux and Cloud Computing

Theory: 00 Teaching Hours Credits – 4

Linux

Cloud Computing

Course Outcomes - At the end of this course students will be able to:

CO1.To Identify the key features of cloud computing and describe the architecture of cloud services.
CO2.Explain how virtualization works at the OS level, including the virtualization of CPU, memory, and I/O devices.
CO3.Examine how cloud-based solutions can enhance productivity and streamline various processes in organizations.
CO4.Analyze and categorize different cloud applications across business, education, entertainment, and social media sectors

SR No.	Content
1.	Set Up a Cloud Storage Service (IaaS) to Configure Cloud Storage
2.	Create a Virtual Machine Using VirtualBox (Virtualization)
3.	Deploy a Simple Web App on a PaaS Platform (Heroku)
4.	Set Up and Interact with a Cloud Database.
5.	Create a Virtual Private Network (VPN) on the Cloud (Private Cloud)
6.	Set Up a Simple Cloud-based Email Application (SaaS)
7.	Explore Virtualization of CPU and Memory (Hypervisor-level)
8.	Explore Social Media Apps in the Cloud (SaaS)
9.	Use Google Cloud for Hosting a Simple Website (Public Cloud)

Semester VI

Course Code: DSC04COM61	Course Name: Java Programming	Credits: 02	Marks : 40
Course Outcomes	**After completion of this course students will be able to –** CO1.Use the syntax and semantics of java programming language and basic concepts of OOP. CO2.Apply the concepts of Multithreading and Exception handling to develop efficient and error free code. CO3Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages. CO4.Design and program stand-alone Java applications and GUI		
Module	**Descriptions**		**Teaching Hrs.**
I	**Introduction to Java and Object Oriented Programming** **(A)Introduction to Java:** History of Java and features of Java, Primitive Data Types- Integer (byte, short, int, long), floating point (float, double), char, boolean, Non-Primitive Data Type – String, Java Keywords, variables, constants, Operators- arithmetic, relational, logical, unary, ternary, bitwise, Branching and looping statements, Typecasting- Implicit and Explicit, wrapper classes, Command line arguments, Writing simple java program, compiling and executing Java program (javac, java commands). **(B)Object Oriented Programming using Java:** Introduction- Class, Object and methods, Access modifiers and accessibility, Static members, constructors, destructor and this keyword, Encapsulation and Abstraction, Inheritance- Definition and its types single, multilevel, hierarchical, Interface – definition and implementation, Abstract Class – definition and use, Polymorphism- Definition and concepts of method overloading and overriding, Final method and Final Class, Java Packages – introduction, defining packages, CLASSPATH, importing packages, System Packages – java, lang, awt, javax, swing, net, io, util.		**15**
II	**Multithreading, Exception Handling, GUI Programming and Event Handling** **(A)Multithreading and Exception Handling:** Introduction to Multithreading, Understanding Threads, Thread Life-Cycle, Creating threads using Thread class & Runnable Interface, Thread Priorities, Exception handling - Fundamentals of exception handling, Exception types, Using try and catch, multiple catch clauses, throw, throws and finally, Built- in exceptions, Creating own exception sub classes. **(B)GUI Programming and Event Handling:** Introduction to GUI, Abstract Window Toolkit (AWT), Component and Container, Using Containers - Frame and Panel, Layout Managers - Flow Layout, Grid Layout, Card Layout, Border Layout, AWT Components – Label, Button, Text Field, Checkbox, Checkbox Group, Event Handling- The Delegation event model, Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.		**15**
	Reference Books 1. Programming with Java A Primer, E. Balaguruswamy, Tata McGraw Hill Companies. 2.Java : The Complete Reference, Herbert Schildt, Tata McGraw-Hill 3.Java Programming- Rajendra Salokhe (Aruta Publication) 4.THE Java™ Programming Language, Fourth Edition By Ken Arnold, James Gosling, David Holmes 5.Introduction to Java programming, By Y. Daniel Liang, Pearson Publication.		

Course Code: DSC04COM62	Course Name: Data Warehousing and Data Mining	Credits: 02	Marks : 40

Course Outcomes	After completion of this course students will be able to - CO1. Define the Data warehouse architecture and its Implementation. CO2. Describe the Architecture of a Data Mining system. CO3. Understand the various Data preprocessing Methods. CO4. Perform classification and prediction of data.

Module	Descriptions	Teaching Hrs.
I	**Data Warehousing:** Introduction to data warehousing, Data warehousing components, Building a data warehouse, Difference between database system and data warehouse, Data warehouse architecture	7
II	**Data Mining:** Introduction of data mining - Definition and functionalities Issues in DM, Applications of data mining, KDD process. Data Pre-processing: Data Pre-processing, Data cleaning, Data integration and transformation, Data reduction, Discretization and concept hierarchy generation, Data mining Tasks	7
III	**Data Mining techniques:** Frequent item - set and association rule mining: apriori algorithm, use of sampling for frequent item- set tree algorithm, Graph sampling : frequent sub graph mining , tree mining ,sequence mining Classification and Prediction - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification –Prediction – Accuracy and Error Measures .	8
IV	**Cluster Analysis:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods – K-Means and K-Medoids	8
	References: 1. Kimball, Ralph & et al, The Data Warehouse Lifecycle Toolkit, John Wiley & Sons, 2006. 2.Jiawei Han and MichelineKamber : —Data Mining Concepts and Techniques‖, 3rd Edition,Elsevier,2012. 3. Arun K. Pujari, "Data Mining",University Press. 4. PaulrajPonnian, —Data Warehousing Fundamentals‖, John Willey	

Course Code: DSC04COM63	Course Name: Computer Networking	Credits: 02	Marks : 40

Course Outcomes	After completion of this course students will be able to - CO1.Define, use and implement Computer Networks and the basic components of a Network system. CO2.Know and Apply pieces of hardware and software to make networks more efficient, faster, more secure, easier to use. CO3.Able to transmit several simultaneous messages, and able to interconnect with other networks. CO4.Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

Module	Descriptions	Teaching Hrs.
I	**Basics of Data communication** 1.1. Data Communication concept 1.1.1 Components-sender, receiver, message, transmission media 1.1.2 Data Flow- simplex, half-duplex, or full-duplex 1.2 Networks 1.2.1 Definition, Advantages and disadvantages 1.2.2 Categories of Networks- LAN, WAN. MAN 1.2.3 Network Architecture-Client-Server and Peer to peer 1.3 Multiplexing and switching 1.3.1 Frequency-Division Multiplexing, WavelengthDivision Multiplexing, Time-Division Multiplexing 1.3.2 Circuit switching, Packet Switching, Message Switching	7
II	**Transmission media and Reference Models** 2.1 Transmission Media 2.1.1 Guided Media - Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable 2.1.2 Unguided Media: Radio Waves, Microwaves, Infrared, satellite communication 2.2 Transmission Modes- Parallel and Serial - (Asynchronous, Synchronous) 2.3 Reference Models 15 2.3.1 OSI reference model 2.3.2 TCP/IP reference model 2.3.3 Comparison of OSI and TCP/IP reference model 2.4 Protocol Standards 2.5 IP address scheme and characteristics of IP address	7
III	**Data link, Network and Transport layer** 3.1 Data link Layer- 3.1.1Design issues 3.1.2 Framing, error detection and correction 3.2 Network layer 3.2. 1 design issues of network layer 3.2.2 Routing algorithm (shortest path, Flooding, distance vector,) 3.2.3 Congestion control 3.3 Transport layer 3.3.1 Transport Layer Primitives: listen, connect, send, receive, disconnect 3.3.2 Protocols: TCP, UDP	8
IV	**Session, Presentation and Application layer** 4.1 Session layer: 4.1.1 Services: dialog management, synchronization, activity management, exception handling 4.1.2 Remote procedure calls 4.2 Presentation layer: 4.2.1 Services: Translation, compression, encryption 4.2.2 Cryptography: concept, symmetric key & asymmetric key cryptography 4.3 Application layer: 4.3.1 Function4.3.2 Domain name system (DNS),Hypertext Transfer Protocol (HTTP),Simple Mail Transfer Protocol (SMTP) ,Telnet, File Transfer Protocol (FTP)	8
	References: 1. Computer Networking :A top down approach , James Kurose Pearson 2. Computer Networks Tanenbaum,Pearson Education India 3. Network Warrior Gary A. Donahue ,O'Reilly 4. S. Keshav, An Engineering Approach to Computer Networking. 5. Douglas E. Comer, Computer Networks and Internets	

Course Code: DSC04COM64	Course Name: MySQL	Credits: 02	Marks : 40

After the successful completion of the course the students are able to-

CO1.Understand basic SQL syntax and how to write queries.

CO2.Work with database and table structures, operations, functions etc.

CO3.Can work in relational databases and in web applications etc.

CO4.Work with advanced SQL features like wildcards and aliases.

Module	Description	Module
I	**Introduction to Databases and MySQL** **Introduction to Databases**: What is a database? Types of databases (Hierarchical, Network, Relational). DBMS: Definition, components, and advantages. Relational Model and MySQL overview. **Introduction to MySQL**: What is MySQL? Features and benefits of MySQL as an RDBMS. Installation of MySQL on different platforms. Overview of MySQL Workbench and Command Line Interface (CLI). **Basic MySQL Operations**: Creating databases, tables, inserting, and updating data.	7
II	**SQL Basics and Data Types** **SQL Overview**: Introduction to SQL (Structured Query Language).Types of SQL statements: DDL, DML, DCL, TCL. **SQL Data Types**:Numeric: INT, FLOAT, DOUBLE, DECIMAL.String: CHAR, VARCHAR, TEXT, BLOB.Date/Time: DATE, DATETIME, TIME, TIMESTAMP.Other: BOOLEAN, ENUM, JSON. **Basic SQL Queries**:SELECT, INSERT, UPDATE, DELETE statements with example	8
III	**Database Design, Keys, and Constraints** **Database Design**:Normalization: First, Second, and Third Normal Forms (1NF, 2NF, 3NF).ER (Entity-Relationship) diagrams: Basics and designing simple relationships. **Keys and Constraints**:Primary Key, Foreign Key, Unique Key, Composite Key. NOT NULL, UNIQUE, DEFAULT, and CHECK constraints. **Relationships and Integrity**:One-to-One, One-to-Many, Many-to-Many relationships. Referential Integrity and enforcing foreign key constraints.	7
IV	**Advanced SQL Queries and MySQL Administration** **Advanced SQL Queries**:Joins: INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL JOIN.Subqueries: Nested SELECT, correlated subqueries.Grouping and Aggregation: GROUP BY, HAVING, COUNT, SUM, AVG, MIN, MAX.Sorting and Filtering: ORDER BY, LIKE, IN, BETWEEN, and logical operators. **Transactions and Concurrency**:Transaction Control: COMMIT, ROLLBACK, SAVE POINT.Handling concurrency with ACID properties. **MySQL Administration**:User management: Creating users, granting and revoking permissions.Backup and restore: Using mysqldump for backup and restore.	8
	Books Recommended: 1. Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke. 2. "MySQL: The Complete Reference" by Vikram Vaswani. 3. "Learning MySQL" by Seyed M. A. 4. "MySQL for Developers" by Hugh E. Williams and Saied M. S.	

Course Code: DSE04COM61	Course Name: R Programming	Credits: 02	Marks : 40
Course Outcomes	After completion of this course students will be able to - CO1.Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. CO2.Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. CO3.Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python. CO4.Identify the commonly used operations involving file systems and regular expressions.		
Module	**Descriptions**		**Teaching Hrs.**
I	**Introduction to R:** Installation of R &RStudio, Features of R, Variables, Constants, Operators in R, Datatypes and R Objects, Accepting Input, Important Built-in functions, Creating Vectors, Accessing elements of a Vector, Operations on Vectors, Vector Arithmetic		7
II	**Control statements and functions:** Control statements: if...else, if else() function, switch() function, repeat loop, while loop, for loop, break statement, next statement, Formal and Actual arguments, Named arguments, Global and local variables, Argument and lazy evaluation of functions, Recursive functions. Creating strings, paste(), Formatting numbers and string using format(), String manipulation		7
III	**Matrices, Arrays and Data frames:** Creating matrices, Accessing elements of a Matrix, Operations on Matrices, Matrix transpose, 3 Creating arrays, Accessing array elements, Calculations across array elements, Introduction to data frames and basic operations on data frames.		8
IV	**Introduction to Data Visualization:** Data visualization basics, Installing and loading packages, importing data, Working with missing data, Extracting a subset of a data frame, Scatter Plot, Box Plot, Bar plot, Plotting categorical data, Stacked bar plot, Histogram, plot() function and line plot, pie chart / 3D pie chart.		8
	Books Recommended: 1. R. NageswaraRao, —Core Python Programming‖, Dreamtech 15 2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf. 3. Programming with python, A users Book, Michael Dawson, Cengage Learning 4. Python Programming: An Introduction to Computer Science Paperback – a. by John M Zelle. 5. Python Crash Course, 2nd Edition Paperback –by Eric Matthes.		

Course Code: DSE04COM61	Course Name: Internet of Things	Credits: 02	Marks : 40
Course Outcomes	After completion of this course students will be able to - CO1. To design some IOT based prototype. CO2. Analyze the different digital marketing avenues. CO3. Examine digital marketing tools. CO4. Examine digital marketing tools.		
Module	**Descriptions**		**Teaching Hrs.**
I	**Fundamentals of IoT** : Overview of basic electronics and basic components used in electronics lab: Resistors, Capacitors, Diodes, Transistors, Overview of digital electronics: Logic Gates and Families, Arithmetic circuits, Decoders, Multiplexers, flip flops, Shift Register, Integrated Circuits, Overview of Microprocessor and Microcontroller, Common features of Microcontroller.		7
II	**IoT Environment:** Introduction to embedded system: History, Classifications and applications of embedded systems, Design principals of IoT architecture, Outline of IoT architecture, Various platforms of IoT, Key features of IoT, IoT Hardware, IoT Software, IoT protocols,Real time examples of IoT, Advantages of IoT,		7
III	**Introduction to Arduino :** Arduino Uno architecture, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Arduino IDE Interfacing basic hardware components with Arduino, Software and Libraries		8
IV	**IoT Application Development "** Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions, Arduino i/o Functions: Pins Configured as INPUT, Pullup Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalRead() Function, digitalWrite() Function, analogRead() function, analogWrite() function, Arduino time Functions: delay() function, delayMicroseconds() function, millis() function, micros() function,		8
	Books Recommended: 1. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things Key applicationsand Protocols‖, Wiley, 2012. 2. Vijay Madisetti and ArshdeepBahga, —Internet of Things (A Hands-onApproach)‖,1st Edition, VPT, 2014 3. CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1 4. Arduino, The complete guide to Arduino for beginners, including projects, tips, tricks, and programming!,James Arthur, 2020		

Course Code: SEC04COM61	Course Name: Cyber Security II	Credits: 02	Marks : 40
Course Outcomes	**A After completion of this course students will be able to -** CO1.Understand importance of cyber security and security management. CO2.Learn different security threats. CO3.Understand cyber security laws and importance of security audit. CO4.Learn concept of wireless network security.		
Module	**Description**		**Teaching Hrs.**
I	**Security Threats and Access Controls** Security Threats: Definition, Types of Threats - Virus, Worms, Trojan Horse, Malware, Ransomware, Identity theft etc, Torrent and infected websites, Antivirus-Definition, Types, features, advantages, limitations. Access Controls: Overview of Authentication and Authorization, Overview of Intrusion Detection Systems, Intrusion Detection Systems and Intrusion		8
II	**Wireless Network Security** Wireless Network Security- Components of wireless networks, Security issues in wireless, Wi-Fi Security, Risk of Using Unsecured Wi-Fi, Bluetooth and its security, Firewall, types of firewall.		8
	Books Recommended: 1. Computer Network -AS Tannenbum 2. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyber war, Hacking) - Harry Colvin. 3. How NOT To Use Your Smartphone - Rodney D Cambridge. 4. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book -A.M. Perry. 5. Cyber Security Essentials- James Graham, Richard Howard, Ryon Olson		

Field Project
Course Code: FPR04COM51
Marks: 50 Credit : 2

B.C.A Part – III
Semester – VI Part- III
Lab I Course XI Based on DSE (Java Programming and MySQL)
Theory: 60 Teaching Hours Credits – 4

Java Programming

Course Outcomes - At the end of this course students will be able to:

CO 1: Implement the Concept of OOP in Java through simple programs.

CO 2: Implementation and Evaluation of concept related to class and inheritance, concept of Multiprogramming and Exception Handling

CO 3: To write programs for solving real world problems.

CO 4: To write multithreaded programs

Sr no.	Content
1	Java programs based on command line arguments
2	Java programs based Type Casting
3	Java programs based on branching and looping statements
4	Java programs based on constructors
5	Java programs based on method overloading
6	Java programs based on interfaces
7	Java programs based on inheritance
8	Java programs based on packages
9	Java programs based on multithreading
10	Java programs based on exception handling
11	Java programs with applets.

MySQL

SR No.	Content
1.	Practice basic MySQL operations such as creating databases, tables
2.	Perform basic MySQL operations and manipulating data using CRUD operations (Create, Read, Update, Delete).
3.	Perform SQL statements(DDL, DML, DCL, TCL.)
4.	Write SQL queries to retrieve and manipulate data.
5.	Learn about MySQL data types and apply constraints while creating tables.
6.	Understand and implement keys and relationships in MySQL databases.
7.	Explore advanced SQL queries involving joins and subqueries.
8.	Learn to manage transactions and handle concurrency in MySQL databases.
9.	Practice MySQL user management and perform database backups and restores.

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