ShriAcharyaratnaDeshbhooshanShikshanPrasarakMandal's
Mahavir Mahavidyalaya, Kolhapur (Autonomous)
AffiliatedtoShivajiUniversity,Kolhapur

AccreditedbyNAACwith'A'Grade

Syllabus for NEP 1.0 Bachelor of Science (B.Sc.) Programme

Part	**III**	**Course**	**Computer Science**

UndertheFacultyofScience

(To be introduced from Academic Year 2025 – 26 onwards)
Subject to the revisions & modifications made from time to time

- **STRUCTUREOFCOURSE:**

Sr. No.	Paper	NameofPaper	Marks
ComputerScience(SemesterV)			
1	DSE-H9	CoreJava	50(40+10) 40 : ESE 10 : CIE
2	DSE-H10	C#Programming	50(40+10) 40 : ESE 10 : CIE
3	DSE-H11	Fundamentals of Networking	50(40+10) 40 : ESE 10 : CIE
4	**Elective** Paper I	PythonPart-I	50(40+10) 40 : ESE 10 : CIE
		R Programming-I	50(40+10) 40 : ESE 10 : CIE
ComputerScience(SemesterVI)			
5	DSE-H12	AdvanceJava	50(40+10) 40 : ESE 10 : CIE
6	DSE-H13	ASP.NET	50(40+10) 40 : ESE 10 : CIE
7	DSE-H14	Cyber Security Essential-I	50(40+10) 40 : ESE 10 : CIE
8	**Elective** Paper II	PythonPart-II	50(40+10) 40 : ESE 10 : CIE
		R Programming -II	50(40+10) 40 : ESE 10 : CIE
PracticalSem-V			
1	PracticalPaper-V	ComputerSciencePracticalPaperBasedon DSE-H9,H10,H11	75Marks
	Elective Practical I	Elective Paper I	25 Marks
	FP	Field Project	50 Marks
PracticalSem-VI			
2	PracticalPaper-VI	Computer Science Practical Paper Based onDSE-H12,H13,H14	75 Marks

	Elective Practical II	Elective Paper II	25 Marks
	OJT	On Job training	50 Marks

B.Sc.Part–IIIComputerScienceOptional(Semester–V)
Course Code: DSE-H9 Computer Paper IX

CourseTitle:CoreJava

TotalContactHours:36Hrs.(45Lecturesof48Min.) Teaching

Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

Course Outcomes:

- Understandstructureofjavaprogram, JVM,typeconversion
- Explainandimplementsprogramsinjavausingcontrolstatements,methodoverloading, constructors,keywords this and static
- Implement multithreadinginobjectorientedprograms.Understandconceptofcheckedanduncheckedexception and write exception handling programs.

Module	Content	Hours Allotted
I	• **Introductionto java And OOP's Concepts** **Introduction to Java** : History of java, Features of Java, structure ofjava program – compilation and execution of program, Comparison between C++ and java,JDK Tools, Java Virtual Machine(JVM), Automatic Garbage Collection, Data Types, Tokens ,Java Keywords, Type conversions -implicit and explicitconversion,Acceptinginputfromconsole(Usingscanner class and command line arguments), Operators - arithemetic, relational, logical,unary,ternary,bitwise,Branchingandlooping statement **OOPinJava:** IntroductiontoClass,Objectandmethod,statickeyword, Constructor, this keyword, constructor overloading Inheritance-Definition and its types - single, multilevel, hierarchical concepts of overloading and method overriding, super Keyword, DifferencebetweenOverloadingandoverriding,AbstractClasses and abstract methods, Defining and Implementing Interfaces	**18**
II	• **Package**,**Exception Handling and Multithreading** **Package**:Definingpackage,SystemPackages–java, lang,awt, javax, swing, net, io, util., user defined packages-creating and accessing the package **ExceptionHandling**-Concept,types-Checkedandunchecked, try and catch block, multiple catch, Try-catch –finally block, throw and throws clause, finally clause **Multithreading**-Whatarethreads?,differencebetweenprocess andthread,Lifecycleofthread,methodsofthreadclass,creating	**18**

	threadusingthreadclassandrunnableinterface,isAlive()and join() methods, Thread priorities , Running multiple threads ,Synchronizationandinterthreadcommunicationwait(),notify(), notifyAll() methods	

ReferenceBooks

1. ProgrammingwithJAVA,APrimerbyEBalaguruswamy
2. HerbertSchildt,Java2:TheCompleteReference,TataMcGraw-Hill
3. JavaProgramming-RajendraSalokhe(ArutaPub)
4. *TheJavaTutorials:http://docs.oracle.com/javase/tutorial/)*
5. TheJavaTutorialsofSunMicrosystemsInc

PracticalBasedonDSE-H9:

1. Javaprogramsbasedonbranchingandloopingstatements.
2. JavaprogramsbasedTypeCasting
3. Javaprogramsbasedoncommandlinearguments
4. Javaprogramsbasedonconstructors
5. Javaprogramsbasedoninheritance
6. Javaprogramsbasedonmethodoverloading
7. Javaprogramsbasedonmethodoverriding.
8. Javaprogramsbasedoninterfaces
9. Javaprogramsbasedonpackages
10. Javaprogramsbasedonmultithreading
11. Javaprogramsbasedonexceptionhandling

B.Sc. Part –III Computer Science Optional (Semester– V)
Course Code: DSE-H10: Computer Paper X
CourseTitle:C#Programming
Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

CourseOutcomes:
This course will cover the practical aspects C#.NET framework. The goal of this course isto introduce the students to the basics of OOPs and windows application program.

Module	Content	Hours Allotted
I	**Introductionto.NetandC#basics** **.NET Framework Architecture**:An Overview, Components of .NET framework: CLR, CLS, Microsoft Intermediate Language ("MSIL" or "IL"), The Common Type System(CTS), Namespaces, Framework Base Classes, Visual studio IDE. **An Overview of C#**:History and Features of C#, Data Types: Value and Reference Types, Boxing and Unboxing □□□Entry point method , Command Line Arguments, □C# Program compilation and execution, Programming Examples using Console application , C#FlowControl:Branching,SwitchingandLooping Structure	**18**
II	**C# ObjectorientedConcepts and IntroductiontoWindows Form Application Using C#** **C#Object oriented Concepts:**Classes and Objects,Inheritance, Polymorphism, interface, Abstract Class, Partial Class, DLL and Exe. ExceptionHandling **IntroductiontoWindowsFormApplicationUsingC#:** Form Controls: Label, Button, Textbox, Checkbox, RadioButton,Timer,calendar,ListBox,Imageandoverviewof remaining all common controls its properties and events	**18**

References:

1. C#4.0TheCompleteReferenceSchildtMcGrawHill
2. InsideC#-ByTomArcher,AndrewWhitechapel(MicrosoftPub)
3. ProgramminginC#-EBalagurusamy

PracticalBasedonDSE-H10:

1. Programoncommandlineargument.
2. Programonparameterpassingmechanism.
3. Programontypecasting.
4. Programonloopingstatements.
5. Programoncontrolstructure.
6. ProgramonDLLandEXE
7. Programonarray.
8. Programonstaticandnon-staticmethods.
9. ProgramonInheritance.

10. ProgramonInterface.
11. Programonabstractclass.
12. Programonpartialclass.
13. Programonexceptionhandling

B.Sc. Part –III Computer Science Optional (Semester– V)

Course Code: DSE-H11: Computer Paper XI

Course Title: Fundamentals of Networking

Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)

Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

Course Outcomes

Studentswillbeableto:

1. learnthebasic ComputerNetworkconcepts.
2. learntechnicalconcepts thatserveasthebasesforthedesignofclassicaland moderncomputer networks.

Module	Content	Hours Allotted
I	**Basicconceptsofnetworking** Componentsofdatacommunication,standardsandorganizations, Network Classification, Network Topologies, network protocol, layered network architecture,overview of OSI reference model, overview of TCP/IP protocol suite. **ISO/OSI Model:** PhysicalLayer:Cabling,NetworkInterfaceCard,Transmission Media Devices-Repeater,Hub,Bridge,Switch,Router,Gateway. DataLinkLayer:Framingtechniques,ErrorControl,FlowControl Protocols, Shared media protocols - CSMA/CD and CSMA/CA. Network Layer: Virtual Circuits and Datagram approach, IP addressing methods – Subnetting,Routing Algorithms (adaptive and non-adaptive) TransportLayer:Transportservices,TransportLayerprotocolof TCP and UDP ApplicationLayer:Applicationlayerprotocolsandservices– Domain name system, HTTP, WWW, telnet, FTP, SMTP.	**18**
II	**IntroductiontoLinuxnetworkingtools** Technical Summary of Linux Distributions, Managing Software Single-HostAdministration:ManagingUsersandGroups,Booting and shutting downprocesses, FileSystems, CoreSystemServices, Process of configuring, compiling, Linux Kernel. IntroductiontoTCP/IP,NetworkManagementTools-Firewall, Thewritecommand,Thewallcommand	**18**

References:

1. ComputerNetwork -ASTannenbum
2. CompTIANETWORK+STUDYGUIDEbyTodd Lammle,Sybex

- **PracticalBasedon DSE-H11:**

1. StudyofdifferenttypesofNetworkcablesandpracticallyimplement thecrosswiredcableand straight through cable using clamping tool.
2. StudyofNetworkDevicesinDetail(Switch,Hub,Routeretc.)
3. StudyofNetworkIP.
4. ConnectthecomputersinLocalAreaNetwork.
5. Practicalbased onbasicnetwork commandsand Networkconfiguration.
6. Practicalbasedonnetworktopology.
7. Practicalbasedonprintersharingconfigurationinworkgroup.

B.Sc. Part –III Computer Science Optional (Semester– V)

Elective Paper I
CourseTitle:PythonPart-I
Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks:40**

CourseOutcomes:

1. TounderstandwhyPythonisausefulscriptinglanguagefordevelopers
2. TolearnhowtowriteloopsanddecisionstatementsinPython
3. Tolearnhowtouselists,tuples,anddictionariesinPythonprograms

Module	Contents	Hours Allotted
I	• **Introduction** History, Features, Structure ofa Python Program(Python Shell Indentations, Comments), Python Interpreter, Writing and executingsimpleprogram,VariableandDataTypes,Operators, Keywords, Type conversion, Input , output functions(Print(),Input(), raw_input()). • **Conditional statements** If,If-else,Nestedif-else • **LoopingStatements** For,While,Nestedloops. • **ControlStatements** Break,Continue,Pass • **StringManipulation** Declaring strings, Accessing Strings, escape sequences (\), OperationsonString(Concatenation(+), Repetition(*), Slicing ([index]),RangeSlicing([start:end]or[:end]or[start:],Member ship operator (in, not in)), StringFunctionsandMethods	**18**
II	• **Lists:** Creating a list, Displaying list(print()), Basic Operations(Length (len()),Concatenation(+),Repetition(*),Membership (in, not in), Iteration (for var in list), Slicing, Updating(=) and deleting(del) element of a list, List functions and methods. • **Tuples**: Creating tuples and Deleting tuple, empty tuple, Displaying(print()), Basic Operation(Length (len()), Concatenation(+), Repetition(*),Membership(in,notin),Iteration(forvarinlist), Slicing)), Tuple functions and mehods. • **Dictionaries** Concept ofdictionary, Creating Dictionary({Key:Value,…}), PropertiesofDictionarykeys,BasicOperation(Length(len()), Compare (cmp())), Dictionary Methods(Clear (dict.clear())), Existance of Key (dict.has_key()), List of dictionaries tuple pairs (dict.items()), List of keys (dict.keys()), Add dictionary (dict.update()),DictionaryValues(dict.values()))	**18**

ReferenceBooks

1. Practical Programming: An introduction to Computer Science Using Python, secondedition, PaulGries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. PythonforInformatics:ExploringInformation,CharlesSeverance
3. LearningPython,FourthEdition,MarkLutz,O'Reillypublication
4. Introduction to Python for Computational Science and Engineering (A

beginner's guide),Hans Fangohr
5. JohnVGuttag.“IntroductiontoComputationandProgrammingUsingPython”,Prentice
6. HallofIndia
7. R.NageswaraRao,“CorePythonProgramming”,Dreamtech

PracticalBasedonElective paper I:

1. Programbased onpythonsimpleconcepts.
2. Programbasedonconditionalconstructs
3. Programbased on loops.
4. Programbasedoncontrolstatements.
5. Programbasedonstring
6. Programbasedonstringfunctionsandmethods
7. Programbased on list
8. ProgrambasedonListmethodsandfunctions
9. Programbasedon tuple
10. Programbasedontuplemethodsandfunctions
11. Programbasedondictionary
12. Programbased ondictionarymethodsandfunctions

B.Sc. Part –III Computer Science Optional (Semester– V)

Elective Paper I

Course Title: R Programming -I

Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)

Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

Course Outcomes

Studentswillbeableto:

3. learnthebasic ComputerNetworkconcepts.
4. learntechnicalconcepts thatserveasthebasesforthedesignofclassicaland moderncomputer networks.

Module	Content	Hours Allotted
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.	**18**
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	**18**

References:

1. R Programming for Data Science Peng, R.D. (2020) Bookdown: New York.
2. An Introduction to Statistical Learning by Gareth James (2017) Publisher: Springer
3. R for Data Science by Garrett Grolemund and Hadley Wickham, Publisher: O'Reilly Media, Inc. 2017.
4. R Fundamentals by Sosulski, K. (2018) Bookdown: New York.
5. Discovering Statistics Using R by Andy P. Field, SAGE Publications Limited.

- **PracticalBasedonElective paper I:**

1. Findthefactorialofanumber
2. Checkwhetheranumber isprimeor not
3. FindSum,MeanandProductofVector
4. GenerateRandomNumberfromStandardDistributions
5. FindMinimumandMaximum
6. CheckArmstrongNumber
7. SumofNaturalNumbersUsing Recursion
8. PrinttheFibonacciSequence

B.Sc.Part–IIIComputerScienceOptional(Semester–VI) Course Code: DSE-H12 Computer Paper XII

CourseTitle:AdvancedJava

TotalContactHours:36Hrs.(45Lecturesof48Min.) Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks:40**

Course Outcomes:

- Onsuccessfulcompletionofthecourse,the studentswillbe ableto,
- CreateafullsetofUIWidgetsusingAbstractWindowingToolkit(AWT)&Swings
- LearntoaccessdatabasethroughJavaprograms, usingJavaDataBaseConnectivity(JDBC).
- Createdynamicwebpagesusing Servlets
- Createdynamicwebpagesusing JSP.

Module	Content	Hours Allotted
I	**AWTAndSwing** **Awt**-What is AWT ? classes hierarchy, windows fundamentals Frame WindowsEventClasses:MouseEventClass,ActionEventClass,Window Event Class, Event Listner Interface: Mouse Listener, Action Listener, Window Listener and Key Listner **AWTControls**:Labels,TextField,Pushbuttons,LayoutManagers(Flow Layout, Border Layout, Grid Layout, Card Layout) **Swing**- What is Swing? Difference between AWT and Swing., The MVC ArchitectureandComponents–JFrame,JButton,JLabel,JText, JTextArea, JCheckBox and JRadioButton, JList, JComboBox, JMenu ,JtabbedPane , JScrollBar , Dialogs (Message, confirmation, input)	**18**
II	**JDBC,Servlet And JSP** **What is JDBC** ? Steps for connectivity between Java program and database. ,Type of drivers,Simple program - database operations like creatingtables,CRUD(Create,Read,Update,Delete)operationsusingSQL **Introduction of servlet**: How servelet work, model diagram,Uses of servlet, Life cycle of servlet, Servlet API: packages- javax. servlet and javax. servlet.http, Session Tracking Mechanism-HttpSession, Cookies, URL-Rewriting, Hidden-Form Fields **IntroductiontoJSP:**LifeCycleofJSP,JspDirectives-1.page 2.include 3.taglib,JspScriptingElements-1.declaratives2.scriptlets3.expressions, Simple application using JSP, Difference between JSP and Servlet	**18**

ReferenceBooks

1. ProgrammingwithJAVA,APrimerbyEBalaguruswamy
2. HerbertSchildt,Java2:TheCompleteReference,TataMcGraw-Hill
3. JavaProgramming-RajendraSalokhe(ArutaPub)
4. Java2BlackBook–(DreamTech)
5. *TheJavaTutorials:http://docs.oracle.com/javase/tutorial/)*
6. TheJavaTutorialsofSunMicrosystemsInc

PracticalBasedonDSE-H12:

1. ProgramonSwing
2. Simpleprogramusingservlet

3. SimpleprogramusingJSP
4. ProgramonDatabaseConnection.
5. Developajavaapplicationtostoreimageinadatabaseaswellasretrieveimagefromdatabase
6. Create EMP table in Database and perform insert, update, anddelete operation onEMP table usingJSP.

B.Sc. Part –III Computer Science Optional (Semester– VI)
Course Code: DSE-H13: Computer Paper XIII
CourseTitle:ASP.NET
Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

CourseOutcomes:
Thiscoursewillcoverthepracticalaspectsofmulti-tierwebbasedapplicationdevelopment using the .NET framework. The goal of this course is to introduce thestudentstothebasicsof distributed Web application development.

Unit	Content	Hours Allotted
I	• **IntroductiontoASP.Net**: Web browser, web server,HTTP request response structure,HTML form elements, GET/POST method, Client side and Server side programming, Web form life cycle, page events, • **Asp.NetControls:** • **Server Controls:** Textbox, Listcontrols, FileUpload, Linkbutton, Imagemap, Image, Imagebutton, Calender, Literal control, Radiobutton, Checkbox • Cross page postback property of button, Response.Redirect, Server.transfer,Response.Write • ValidationControls • Navigationcontrols-Menu,TreeView,SiteMapPath • MasterPage	**18**
II	**Asp.NetStateManagementandADO.Net** • Asp.NetStateManagement Client Side: Hiddenfield control, View State,Cookies Server Side: Session, Application, Global.asax. • Data controls:Gridview,Listview,FormView,DetailsView, Repeater • SqlServerDatabase. • IntroductiontoADO.Net • ADO.NETArchitecture-Connection,command,datareader, data adapter, data set • UnderstandingconnectedlayerofADO.NETand disconnectedlayer of ADO.NET • BasicsofCrystalreports	**18**

ReferenceBooks:

1. BeginningASP.NET4.5inC#andVB,Wrox,2012,ISBN-10:1118311809
2. BeginningASP.NET4.5inC#,Apress,2012,ISBN-10:1430242515
3. ProC#with.NET3.0,AndrewTroelsen,Apress,2007,ISBN978-1-59059-823-8

PracticalBasedonDSE-H13:

- Programonservercontrols
- ProgramonValidationControls
- ProgramonNavigationControls.
- ProgramonSqlDataSource.
- Programondatacontrols
- ProgramonADO.Netconnectedarchitecture.
- ProgramonADO.Netdisconnectedarchitecture
- ProgramonResponse.Redirect.
- Programoncrosspageposting.
- Programonclientsidestatemanagement.
- Programonserversidestatemanagement.
- ProgramtodesignmasterpageforCollegewebsite.

B.Sc. Part –III Computer Science Optional (Semester– VI)
Course Code: DSE-H14: Computer Paper XIV
CourseTitle: Cyber Security Essential-1
Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks:40**

Course Outcomes

Studentswillbeableto:

1. Understandconceptofinformationsecuritymanagement.
2. Learndifferentaccesscontrols methods.
3. Understandwirelessnetwork security.
4. Learncybersecuritylawsandimportanceofsecurityaudit.

Unit	Content	Hours Allotted
I	• **InformationSecurityManagement** InformationSecurityOverview:BackgroundandCurrentScenario, Types of Attacks, DoS attack, Goals for Security, E-commerce Security, dimensions of E-commerce security,Security protocols,Computer Forensics, Steganography. SecurityManagement-OverviewofSecurityManagement,Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery,EthicsandBestPractices.	**18**
II	• **NetworkSecurity,AccessControls,CyberSecurityandCyber Laws** **WirelessNetworkSecurity**-Componentsofwirelessnetworks,Security issues in wireless,Wi-FiSecurity, Risk of Using Unsecured Wi-Fi, Bluetooth and its security, Firewall, types of firewall. **Access Controls**: Overview of Authentication and Authorization, OverviewofIntrusion,DetectionSystems,IntrusionDetectionSystems and Intrusion Prevention Systems. **CyberSecurity**:Emailsecurity:PGPandSMIME,WebSecurity:web authentication, SSL and SET, Database Security. **CyberSecurityLaws:** SecurityAssurance,SecurityLaws, Intellectual Property Rights, International Standards, Security Audit- Need, Importance.	**18**

- **References:**

1. ComputerNetwork-ASTannenbum
2. CyberSecurityforBeginners:Everythingyouneedtoknowaboutit(Cybersecurity,Cyber war, Hacking) - Harry Colvin.
3. HowNOTToUseYourSmartphone-RodneyDCambridge.
4. OnlineSafety:Scams,SPAM,VirusesandClouds(CyberSecurityCommunityBook -A.M. Perry.
5. CyberSecurityEssentials-JamesGraham,RichardHoward,RyonOlson (E-book)

- **PracticalBasedon DSE-H14:**
    1. Practicalbasedonantivirus installationand update.
    2. Practicalbasedonbackupandrestoresystem.
    3. Practicalbased onuseaccess permission.
    4. Practicalbasedonoperatingsystemsecurityandapplication.(setpasswordetc.)
    5. Practicalbasedonwireless mode(changeadminpassword,MACaddressing, Bluetooth)
    6. Practicalbased onemailsecurity
    7. Practicalbased onwebsecurity
    8. Practicalbased onbrowsersecurity.

B.Sc. Part –III Computer Science Optional (Semester– VI)

Elective Paper II

CourseTitle:PythonPart-II

Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)

Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks: 40**

Course Outcomes:

1. TolearnhowtowritefunctionsandpassargumentsinPython
2. TolearnhowtobuildandpackagePython modulesforreusability
3. Tolearnhowtouseexceptionhandling inPythonapplicationsforerrorhandling
4. TolearnOOPconceptsinpython.

Unit	Content	Hours Allotted
I	**Functions** Definingafunction,Callingafunction,Typesoffunctions, Function Arguments, Anonymous functions, Scope of variables(Global and local variables) **Modules** Importingmodule,creatingandexploringmodule,Math module, Random module, Time Module, Packages. **Input-Output** Printingonscreen,Readingdatafromkeyboard,Openingand closing file, Reading and writing to files.	**18**

II	**ExceptionHandling** Exception,ExceptionHandling,Except clause,Try,finally clause, User Defined Exceptions **ObjectOrientedProgramming Concepts** **Classes and Objects** : Python Classes, Objects, Specifying attributes and behaviors,instancemethods,instanceattributes, static methods, constructor, types of constructors(default, parameterized), constructor overloading , method overloading **InheritanceandPolymorphism:**InheritanceinPython(Syntax, Advantages,), Access Modifiers in Python, Types of Inheritance (single, multiple, multilevel, hierarchical and hybrid), Polymorphism-Method Overriding, magic methods and Operator Overloading.	**18**

ReferenceBooks:

1. PracticalProgramming:AnintroductiontoComputerScienceUsingPython,second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. PythonforInformatics:ExploringInformation,CharlesSeverance
3. LearningPython,FourthEdition,MarkLutz,O'Reillypublication
4. IntroductiontoPythonforComputationalScienceandEngineering(Abeginner'sguide), Hans Fangohr
5. JohnVGuttag."Introductionto ComputationandProgrammingUsingPython",Prentice Hall of India
6. R.NageswaraRao,"CorePythonProgramming", Dreamtech

PracticalBasedon Elective paper II:

1. Programbased onsimple Pythonfunction.
2. Programbasedonfunctionarguments.
3. Programbased on module.
4. Programthatimportingmathmodule.
5. Programtodemonstrate readandwriteoperationsonfile.
6. Programtodemonstratetoopenandclosefile
7. Programto handlesimple runtimeerror
8. Programtohandlemultipleerrorswithoneexceptstatement
9. Programto createuser-definedexception
10. Write a programtodemonstratethe useofclass
11. WriteaPythonprogramtodemonstrateinheritance
12. WriteaPythonprogramtodemonstrateoverloading

B.Sc. Part –III Computer Science Optional (Semester– V)
Elective Paper II

CourseTitle: R Programming -II

Total Contact Hours: 36 Hrs. (45 Lectures of 48 Min.)

Teaching Scheme: Theory – 03 Lect. / Week

Credits:02 **TotalMarks:40**

Course Outcomes

Studentswillbeableto:

5. Understandconceptofinformationsecuritymanagement.
6. Learndifferentaccesscontrols methods.
7. Understandwirelessnetwork security.
8. Learncybersecuritylawsandimportanceofsecurityaudit.

Unit	Content	Hours Allotted
I	**Matrices, Arrays and Data frames**: Creating matrices, Accessing elements of a Matrix, Operations on Matrices, Matrix transpose, Creating arrays, Accessing array elements, Calculations across array elements, Introduction to data frames and basic operations on data frames.	**18**
II	**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.	**18**

Reference Book:

1. R Programming for Data Science Peng, R.D. (2020) Bookdown: New York.
2. An Introduction to Statistical Learning by Gareth James (2017) Publisher: Springer
3. R for Data Science by Garrett Grolemund and Hadley Wickham, Publisher: O'Reilly Media, Inc. 2017.
4. R Fundamentals by Sosulski, K. (2018) Bookdown: New York.
5. Discovering Statistics Using R by Andy P. Field, SAGE Publications Limited.

- **PracticalBasedonElective paper II:**

1. CheckforLeapYear
2. Checkwhethernumber isOddorEven
3. CheckifaNumberisPositive,NegativeorZero
4. FindtheSumofNaturalNumbers
5. ConvertDecimalintoBinaryusingRecursioninR
6. FindtheFactorialofaNumberUsingRecursion
7. RProgramtoFindH.C.F.orG.C.D.

- **NATUREOFQUESTIONPAPERANDSCHEMEOFMARKING:**

ThepracticalPaper–VisbasedonDSE-H9,H10,H11

Thepractical Elective Paper I

Field Project

ThepracticalPaper–VIisbasedonDSE-H12,H13,H14

ThepracticalElective Paper II

On Job Training

ExaminationPattern:

1.1 EndSemesterExaminationQuestionPaperPattern:40Marks

Q.No.	Nature /Type ofQuestion	Marks	Total
1.	MultipleChoiceQuestion(06)	Eachfor01Marks	06
2.	Short Answers(5)	Eachfor02Marks	10
3.	SolveAny4outof 6	Eachfor03Marks	12
4.	SolveAny1outof 2	Eachfor06Marks	06
5.	SolveAny1outof 2	Eachfor06Marks	06
Total			40

1.2 ContinuousInternalEvaluation(CIE)Pattern:10Marks

MCQ Test(Online/Offline)	AnyOne(10Marks)
Unit Test	
Seminars	

- **NATUREOFPRACTICALQUESTIONPAPER:**

1. The practical question paper V andVI forB.Sc.-III(computer science) will be of maximum 75 marks each.
2. Thepractical paperVhaving six questionsout ofwhich twoquestionsarebasedon Paper – IX (Sem.-V) ,twoquestionsarebasedon Paper –X (Sem.-V),twoquestionsarebasedon Paper –XI (Sem.-V)
3. The practical paper VI having six questionsout ofwhich twoquestionsarebasedon Paper –XII (Sem.-VI) ,twoquestionsarebasedon Paper –XIII (Sem.-VI),twoquestionsarebasedon Paper –XIV (Sem.-VI)
4. The Student has to attempt any THREE questions out of SIX questions. Each question carries 20 marks.
5. 15marksareforVivaandcertified Journal.
6. The student appearing for the practical examination is expected to write paper work for THREEquestions.Paperworkiscompulsoryanditincludesproblemanalysis,Algorithm,source code, output and tracing.
7. It is expected to complete the paper work per section 1 hour. The student has to complete

his/her actual practical experiment on machinewithin 90 minutes. The practical based viva will be of 30 minutes duration.

8. Thedurationofpracticalwillbe2 days.
9. Elective PracticalPaper I and II is 25marks each.

1. Software development project is to be carried out by the candidate in actual consumer environment taking some real life problem.
2. The candidates submit the project work according to norms of software engineering i.e. the project document should contain Introduction, detailed design, sample testing and conclusion.
3. Project will have internal guide to supervise and monitor the progress of the project.The internal guide may assign the project to the student or within the group of student (maximum 2 candidates in group) depending upon the complexity of the problem preferably using MySQL /MSSQL/Oracle as a back end and C#.NET/ASP with C#/PHP/ Java as a front end.
4. There will beonlinedemonstrationofproject workinthe presenceofthe external examiner and it will be considered for the evaluation.

5. ThemarkdistributionforPracticalpaperVIwillbeasfollows:

Project documentation:	30marks On-line
Presentation:	20 marks
Project Based Viva:	30 marks Industrial Visit
Report:	20 marks **Total Marks: 100marks**