

**SWAMI RAMANAND TEERTH**

**MARATHWADA UNIVERSITY, NANDED - 431 606**



**(Structure and Syllabus of Two Years PG Degree Program with  
Multiple Entry and Exit Option)**

**TWO YEAR MASTERS PROGRAMME IN  
SCIENCE**

**Subject: Software Engineering**

**Under the Faculty of**

**Science and Technology**

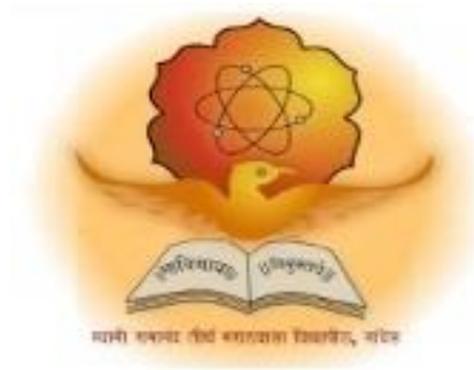
Effective from Academic year 2023 – 2024

(As per NEP-2020)

**Swami Ramanand Teerth Marathwada University**

**Nanded**

**Affiliated Colleges**



**Faculty of Science and Technology**

**NEP-2020 Oriented Structure of Post Graduate Programs**

(as per Govt of Maharashtra GR dated 16-05-2023)

**M.Sc. Software Engineering (affiliated colleges (2 years full time PG Programs))**

***Introduced from Academic Year 2023-2024***

## Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

NEP-2020 oriented Structure of Two years Post Graduate Program

**Subject :** M.Sc. Computer Science (affiliated colleges) / Information Technology / Software Engineering / Computer Management / System Administration and Networking  
(2 years full time PG Programs in Affiliated Colleges )

Introduced from Academic Year 2023-2024 (as per Govt of Maha GR dated 16-05-2023)

Program Year and Sem	Level	Semester	Faculty	Other courses	RM	OJT/FP/	RP	Total Sem. credits	Cumu. Credits		
First year common for all PG programs in the School			<b>Major / Mandatory /</b>	<b>Electives/</b>							
			<b>Theory</b>	<b>Practical</b>	<b>Theory</b>	<b>Practical</b>					
			<b>(04 credits)</b>	<b>(01credits)</b>	<b>(04 credits)</b>	<b>(03+01)</b>	<b>(03credits)</b>	<b>(03 Credits)</b>	<b>(04 Credits)</b>		
			<b>SCMP</b>	<b>SCMP</b>							
M.Sc. CA/ CN/ CS	6.0	First Semester	SSEC-401 SSEC-402 SSEC-403	SSEP-401 SSEP-402 SSEP-403	SSEE-401	-----	SVECR-401 Research Methodology Compulsory	-----	-----	22	22
M.Sc. CA/ CN/ CS		Second Semester	SSEC-451 SSEC-452 SSEC-453	SSEP-451 SSEP-452 SSEP-453	SSEE -451	-----	-----	SSEOJ-451	-----	22	44
PG Diploma			24credits + 06 Credits		06 credits +02 Credits		03credits	03credits	-----	44 credits	
<b>Exit Option: After completion of First year as above with 44 credits, student will be awarded PG Diploma in Computer Science and Applications**</b> <b>** ( for students who have done 03 years UG program)</b> <b>** ( available from AY 2024-2025)</b>											

1. Abbreviations : **S- Science, SE- Software Engineering, Discipline Specific Core course** (C- Core Course)
2. Abbreviations : **SSEE- Discipline supportive Elective Course** (E- Elective Course)
3. Abbreviations : **SVECR: Research Methodology course**
4. Abbreviations : **SSEOJ : On Job Training , Internship/ Apprenticeship or Field Project**
5. Abbreviations : **SSER : Research Project**



### Syllabus First Semester

Core Courses Code	Title	Remarks Credits
SSEC-401	Programming with C++	04
SSEC-402	Linux Operating System	04
SSEC-403	Advanced Web Technology	04
SSEP-401	Lab 1: C++ Lab	01
SSEP-402	Lab 2: Linux Lab	01
SSEP-403	Lab 3: Advanced Web Technology Lab	01
SSEE-401	Chose any one A. Data Science B. Database Administration C. Network Programming	03 Theory and 01 Lab
SSECR-401	Research Methodology	03

### Syllabus Second Semester

Core Courses Code	Title	Remarks Credits
SSEC-451	Windows Programming with C#.NET	04
SSEC-452	Advanced Java Programming	04
SSEC-453	Programming in Python	04
SSEP-451	Lab 4: C#.NET Lab	01
SSEP-452	Lab 5: Java Lab	01
SSEP-453	Lab 6: Python Lab	01
SSEPE-451	Chose any one A. Software Testing B. Data Structure C. Statistical Methods	03 Theory and 01 Lab
SDSCOJ-451	On Job Training , Internship/ Apprenticeship or Field Project	03

**Note : Contents of the common courses in campus and affiliated colleges shall be different**

**M. Sc. First Year, Semester I and II (Level 6.0) : Teaching Scheme**

	Course Code	Course Name	Credits Assigned per course			Teaching Scheme (Hrs/ week) per course	
			Theory	Practical	Total	Theory	Practical
Major	SSEC-401 to SSEC-403 and SSEC-451 to SSEC-453	All Core Course	04	--	<b>04</b>	<b>04</b>	--
Elective	SSEE-401 and SSEE-451	All Elective Courses	03	--	<b>03</b>	<b>03</b>	--
Special Courses	SSECR-401 and SSEO-451	Research Methodology and On Job Training	03	--	<b>03</b>	<b>03</b>	
Major Practical	SSEP-401 to SEP-403 and SEP-451 to SEP-453	All Core labs	--	01	<b>01</b>	--	<b>02</b>
Elective Practical	SSEEP-401 and SSEEP-451	Elective lab	--	01	<b>01</b>	--	<b>02</b>
<b>Total Credits per semester</b>			<b>18</b>	<b>04</b>	<b>22</b>	<b>18</b>	<b>04</b>
<b>Total credits per year</b>			<b>36</b>	<b>08</b>	<b>44</b>	<b>36</b>	<b>08</b>

**M. Sc. First Year, Semester I and II (Level 6.0) : Examination Scheme**

Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
		Continuous Assessment (CA)			ESA	CA (8)	ESA (9)	
		Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)			
SSEC401 to SSEC-403 and SSEC-451 to SSEC-453	All core courses	20	20	20	80	--	--	100
SSEE-401 and SSEE-451	All elective courses	15	15	15	60	--	--	75
SVECR-401 and SSEOJ-451	Research Methodology	15	15	15	60	--	--	75
SSEC-401 to SSEC-403 and SSEC-451 to SSEC-451	All Core Labs	--	--	--	--	05	20	25
SSEEP-401 and SSEEP-451	All Elective labs	--	--	--	--	05	20	25

**Note : Teaching scheme and Examination scheme for Second year will be elaborated later, along with detailed syllabus of Second Year**

## Guidelines for Course Assessment:

- A. Continuous Assessment (CA) (20% of the Maximum Marks):** This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col. 6).
- B. End Semester Assessment (80% of the Maximum Marks):** *(For illustration we have considered a paper of 04 credits, 100 marks and need to be modified depending upon credits of an individual paper)*
1. **ESA Question paper will consists of 6 questions, each of 20 marks.**
  2. **Students are required to solve a total of 4 Questions.**
  3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
  4. **Students need to solve ANY THREE of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.**
- C. Question paper for campus PG and PG in affiliated colleges will be different**

**Note:** Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

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**Course Code: SSEC-401**

**Paper Title: Programming with C++**

**Course Objectives:**

1. To learn the features of an object-oriented programming language viz., data abstraction, data encapsulation, information hiding, inheritance, and dynamic binding of the messages to the methods.
2. To learn and implement inheritance and enhance problem solving skills in C++ with extensive programming projects.

**Course Outcomes:**

1. Describe the procedural and object oriented paradigm with the basic concepts of streams, classes, functions, data and objects.
2. Describe the concept of function overloading, operator overloading, static members, friend functions, friend classes etc.

**Unit I: Introduction to OOPs & C++**

**6**

Introduction to OOPs and its basic features, Basic Components of OOPs, Procedure oriented v/s Object oriented programming, Benefits of OOPs, Applications of OOPs Structure of a C++ program, Decision making, Looping constructs, Arrays, Pointers

**Unit II: Functions**

Functions, Function prototype, Call by value, Call by reference, Call by address, Return by reference , Inline function, Default arguments, Function overloading.

**Unit III: Classes & Objects**

**6**

Introduction to Classes & Objects, Access modifiers – private, public, protected Constructors & Destructor, Types of Constructors, Static member data and functions, Friend function and class, Nested classes, Operator Overloading, Operator Overloading through member function and , friend function, Overloading special operators.

**Unit IV: Inheritance & Polymorphism**

**8**

Introduction to Inheritance, Types of Inheritance, Constructors in Inheritance, Multiple Inheritance, Constructors in Multiple Inheritance Ambiguities in Multiple Inheritance, Introduction to Polymorphism, Virtual Functions & Classes, Pure virtual function and Abstract classes.

**Unit V: Templates, Namespaces, Exception Handling and File Handling**

**10**

Function Template and Class Templates, Introduction to STL, Components of STL Creating namespaces, Nesting of namespaces, Exception Handling, Throwing and catching exceptions, Throwing multiple Exceptions

**Unit VI: File Handling and graphics**

**10**

File Handling, Opening and Closing Files, Reading and Writing data, Random access files, File pointers, Dynamic Memory Allocation for Arrays, Dynamic Memory Allocation for Objects, graphics using c++, Draw a line,

**Reference Books:-**

1. The C++ Complete Reference, IV Edition, Herbert Schildt, McGraw Hill Publication, 2002, ISBN 0071502394, 9780071502399.
2. Object-Oriented Programming with C++, VI Edition, E Balgurusamy, McGraw Hill, 2013, ISBN 125902993X, 9781259029936.

**Course Code: SSEC-402**

**Paper Title: Linux Operating System**

**Course Objectives:**

1. This course shall build a platform for students to start their own enterprise
2. For Making Student Job Ready

**Course Outcome:**

After completion of this course students will be able to

1. Understand the Linux OS architecture.
2. Install and use different types of distributions available in market.

**UNIT I- Introduction to Linux**

**6**

Introduction to Linux ,Advantages of Linux ,Distributions of Linux ,Linux Installation Process ,Hardware Requirements of Linux ,Linux Partitioning ,virtual Memory Space(swap) ,GNOME & KDE Desktop ,`Boot Loader , Login and shutdown

**UNIT II- Linux Shell & file Structure**

**6**

Linux File System , Linux shell and its types , Text Editor , Working with Linux console-text based and virtual based , File name expansion, concept of Pipe, Job:-Background ,Kill & Interruption , Ending Process-PS & KILL , X window system ,Configuration of X window , File system-EXT-2,EXT-3 .

**UNIT III- System user Administration**

**8**

Linux system user Control:-Root user, Root Password, Root user access , System run Levels: telinit, init tab and shutdown:-Run levels, Run levels in init tab, changing run levels with tel init, run level commands , shutdown , Performance analysis tools and Processes,

**UNIT IV- Merging groups**

**10**

Merging groups - group management tools , Adding and removing user with useradd, usermod and userdel, File permissions, Managing Password-policy& shadow password, Managing disk quotas, Configuration and managing Print services, Local Printer configuration, Network Printer Configuration.

**UNIT V-Managing Network Connectivity & security**

**10**

TCP/IP Network address -IPV4 & IPV6 , Class of IP address ,Difference between IPV4 and IPV6, Domain name service, Monitoring network using ping, netstat, tcpdump , Ether Ape ,Ether cap

**UNIT VI-Managing Network Connectivity & security**

**10**

Dynamic host configuration protocol (DHCP), Concept of Comba, Concept and Installation of Apache win server, Public key encryption, integrity check & Digital signature, Wireless Networking.

**Reference books:**

- 1) The Complete Reference of Linux - By Richard Petersen (6th edition)
- 2) Fedora Unleashes - By Bill Ball & David Pits

**Course Code: SSEC-403**

**Paper Title: Advanced Web Technology**

**Course Objectives**

To aware the Students with advanced web technology

To develop a skill to write applications using PHP and Java Script

**Course Outcome**

Students will be able to develop a dynamic webpage by the use of PHP and java script. On completion of this course, a student will be able to develop a web application using PHP and java script.

**Unit-I: Introduction**

**10**

Web Technology & XML Internet – current state, hardware and software requirement, ISP, an internet account, web home page, URL, browser, security on web, searching tools, search engines, FTP, Gopher, Telnet, emails, TFTP Web browser architecture, web page and multimedia, static dynamic and active web page, simple mail transfer protocol, simple network management protocol, hypertext transfer protocol

**Unit-II: Basics of PHP**

**6**

Introduction to PHP, what does PHP do?, History of PHP, language basics, datatypes, variables, expressions and operators, flow control statements, including code, embedding PHP in web pages.

**Unit-III: Functions & Strings**

**6**

Calling a function, defining a function, variable scope, function parameters, return values, variable functions, and anonymous functions. Strings: Accessing individual characters, cleaning strings, encoding and escaping, comparing strings, manipulating and searching strings, regular expressions.

**Unit-IV: Arrays & Objects:**

**10**

Indexed vs. associative arrays, identifying elements of an array, storing data in arrays, multidimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays, sorting. Objects: Creating an object, accessing properties and methods, declaring a class, introspection.

**Unit-V: Database Structure**

**10**

Overview Introduction, connecting to and disconnecting from the server, Entering queries , Creating and using a database , Creating and selecting a database , creating a table , loading data into a table , Retrieving information from a table, selecting all data, selecting particular rows, selecting particular columns , sorting rows, date calculations, working with NULL values , pattern matching , counting rows , using more than one tables.

**Unit-VI: MySQL Database**

**8**

MySQL databases in PHP: Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.

**Course Code: SSEP-401**

**Course Title: Lab 1: C++ Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEP-402**

**Course Title: Lab 2: Linux Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEP-403**

**Course Title: Lab 3: Advanced Web Technology Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEE-401 A**

**Paper Title: Data Science**

**Course Objectives:**

1. To learn data collection and pre-processing techniques for data science
2. To Understand and practice analytical methods for solving real life problems.
3. To study data exploration techniques
4. To learn different types of data and its visualization
5. To study different data visualization techniques and tools

**Course Outcomes:**

1. Apply data pre-processing methods on open access data and generate quality data for analysis
2. Apply and analyze classification and regression data analytical methods for real life problems.
3. Implement analytical methods using Python/R/Excel/Data Studio
4. Apply different data visualization techniques to understand the data.
5. Analyze the data using suitable method; visualize using the open source tool.
6. Model multidimensional data and visualize it using appropriate tool

**UNIT I- Introduction to Data Science**

**8**

Defining data science, Data Science Jobs, Recognizing the different types of data, Gaining insight into the data science process, Data Science Process: Overview, Different steps, Machine Learning Definition and Relation with Data Science. Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.

**UNIT II- Introduction to DBMS and**

**6**

Introduction to Database Management Systems its Purpose and Application, Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Comparative study of SQL and NoSQL.,

**UNIT III- Big Data Science**

**6**

Definition of Big Data, Big data characteristics & considerations, Data repositories- analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data science, Drivers of Big data analytics, Role of data scientist in Big data ecosystem, Applications of Big data analytics.

**UNIT IV- Basics of Data Visualization**

**10**

Introduction to data visualization, challenges of data visualization, Definition of Dashboard, Their type, Evolution of dashboard, dashboard design and principles, display media for dashboard. Types of Data visualization: Basic charts scatter plots, Histogram, advanced visualization Techniques like streamline and statistical measures, Plots, Graphs, Networks, Hierarchies, Reports. Data Science with MS-Excel, Data Science with Google Data Studio

**UNIT IV Basic Data Analytics methods using R and Python**

**10**

Introduction to R: GUI of R, Getting data into & out of R, Data types in R, Basic operations, Basic statistics, Generic functions, Data visualization using R, Data exploration & presentation, Statistics for model building & evaluation

## **UNIT VI- Basic Data Analytics using Python**

**10**

Data Science with Python and Advanced Analytics- Data Science & Python, Python Environment set-up Jupyter and Spyder overview, Data Science in Python, Python Numpy, DataFrame, Python SciPy, Python Pandas, Python Matplotlib, Introduction to Artificial Intelligence and Machine Learning, Machine Learning Algorithms, Supervised and Unsupervised Learning K-means Clustering, Association Rules, Apriori algorithm, Linear Regression, Logistics Regression, Naïve Bayesian classifiers, Decision Trees, Time series analysis, Text analysis

### **References:**

1. R for Data Science- Import, Tidy, Transform, Visualize, and Model Data By Hadley Wickham, Garrett Grolemund · 2016 ISBN 9781491910344, 1491910348
2. Python Data Science Handbook-Essential Tools for Working with Data by Jake VanderPlas, Publisher: O'Reilly Media ISBN: 9781098121228

**Course Code: SSEE-401 B**  
**Paper Title: Database Administration**

**Course Objectives:**

1. To introduce students about the concepts of database administration
2. To teach students about different types of databases.

**Course Outcomes:** After completion of this course students will be able to

1. Distinguish between data administration and database administration
2. Explain the concept of system performance, backup and recovery

**UNIT I: Database Architecture**

**8**

Overview of database, pfile, spfile, Instance, Table spaces, Data files, Other files, Oracle managed Files, Users, Schemas, Indexes, View, Sequences, Synonyms, Privileges, Roles, Clusters, Hash Clusters, Internal memory structure, SGA, PGA ,Background processes, External structure, Redo logs, Control files, Trace files, Alert logs, Creating database manually, Architectural overview, Standalone hosts

**UNIT II: Database in Networking**

**6**

Multiple databases, Networked hosts, Networks of databases, Remote updates, Remote application options, Real application, Clusters, Multiple processors, The parallel query and parallel load options, Client/server databases application, Standby databases.

**UNIT III: Physical & Logical Database Layouts**

**6**

Database file layouts, I/O connections among data files, I/O bottlenecks among all data files, Concurrent I/O among background processes, Defining recoverability and performance goals for the system, Defining the system hardware and mirroring architecture, Database space using overview, Implementation of the storage clause,

**UNIT IV: Managed Tablespaces**

**10**

Locally managed Tablespaces, Dictionary managed Tablespaces, logical structure of a database, Different types of Tablespaces, Changing the Tablespaces size, Allocating segments for temporary segments, Temporary segments in permanents Tablespaces, Changing table space status, changing table space storage settings, Oracle Managed Files (OMFs), Oracle Flexible Architecture (OFA), Different segments types and relationships, Extent usages, Block space utilization.

**UNIT V: Backup & Recovery**

**10**

Types of Logical and Physical backups, Implementations , Integrations of backup procedures, NOARCHIVELOG Mode, ARCHIVELOG Mode, Backup Methods –Closed Database Backup, Open Database Backup, Recovery in NOARCHIVELOG Mode, Recovery in ARCHIVELOG Mode, Recovery manager architecture, Recovery Manager Features, Using Recovery manager & RMAN, Using OEM backup manager, Generating lists and reports.

**UNIT VI: Database Security & Auditing**

**10**

Security capabilities-Account security, Object privileges, System level roles and privileges, Implementing security-operating system security, Create user, Drop user, User profiles, and Password managements, Preventing password reuse, setting password complexity, Using password file for authentication, Auditing, Login audits, Action audits, Object audits, Protecting the audit trail.

**Reference Books**

1. Oracle 9i DBA Handbook, Eighth Reprint - Kevin Lonely, Marlene Theriault Oracle Press, Tata McGraw Hill Publication ISBN-0- 07-048674-3.
2. OCA Oracle 9i Associate DBA Certification Exam Guide, Sixth Reprint, Jason Couchman, Sudheer N. Marishetti Oracle Press,Tata McGraw Hill Publication,2005 ISBN-0-07-049893-8

**Course Code: SSEE-401 C**  
**Paper Title: Network Programming**

**Course Objectives:**

1. To introduce students about the concepts of Network Programming
2. To teach students about TCP Client-Server.

**Course Outcomes:** After completion of this course students will be able to

1. Distinguish between Networking and Network Programming
2. Explain the concept of Multiplexing, TCP Sockets, UDP Sockets

**UNIT I: Introduction**

**8**

A Simple Daytime Client, Protocol Independence, Error Handling: Wrapper Functions, A Simple Daytime Server Sockets Introduction Socket Address Structures, Value-Result Arguments, Byte Ordering Functions, Byte Manipulation Functions, inet\_aton, inet\_addr, and inet\_ntoa Functions, inet\_pton and inet\_ntop Functions, sock\_ntop and Related Functions, readn, writen, and readline Functions, isfdtype Function [Book-1] What is a Socket? Using Sockets

**UNIT II: Elementary TCP Sockets**

**6**

Socket Function, connect Function, bind Function, listen Function, accept Function, fork and exec Functions, Concurrent Servers, close Function, getsockname and getpeername Functions

**UNIT III: TCP Client-Server Example**

**6**

TCP Echo Server: main Function, TCP Echo Server: str\_echo Function, TCP Echo Client: main Function, TCP Echo Client: str\_cli Function, Normal Startup, Normal Termination, Connection Abort before accept Returns, Termination of Server Process, SIGPIPE Signal, Crashing of Server Host, Crashing and Rebooting of Server Host, Shutdown of Server Host

**UNIT IV: I/O Multiplexing:**

**10**

The select and poll Functions, I/O Models, select Function, str\_cli Function (Revisited), Batch Input, shutdown Function, str\_cli Function (Revisited Again), TCP Echo Server (Revisited), pselect unction, poll, Function, TCP Echo Server (Revisited Again) Socket Options: getsockopt and setsockopt Functions, Checking If an Option Is Supported and Obtaining the Default, Socket States, Generic Socket Options, IPv4 Socket Options, ICMPv6 Socket Option, IPv6 Socket Options, TCP Socket Options

**UNIT V: Elementary UDP Sockets**

**10**

recvfrom and sendto Functions, UDP Echo Server: main Function, UDP Echo Server: dg\_echo Function, UDP Echo Client: main Function, UDP Echo Client: dg\_cli Function, Lost Datagrams, Verifying Received Response, Server Not Running, Summary of UDP example, connect Function with UDP, dg\_cli Function (Revisited), Lack of Flow Control with UDP, Determining Outgoing Interface with UDP, TCP and UDP Echo Server Using select. User Datagram Protocol, File Transfer, Error Handling

**UNIT VI: Protocols, Sessions, State, and Implementing Custom Protocols**

**10**

State vs. Stateless, Methods for Maintaining State, What Is a Protocol? Designing a Custom Protocol, Our Chat Protocol, Protocol Registration

**Reference books :**

1. Unix Network Programming, Volume 1: The Sockets Networking API, 3/E by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, PHI
2. The Definitive Guide to Linux Network Programming by KEIR DAVIS, JOHN W. TURNER, AND NATHAN YOCOM, Apress.

## **Course Code: SSECR-401**

### **Paper Title: Research methodology**

#### **Course Objectives**

The main objective of this course is to introduce the basic concepts in research methodology in Social science. This course addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project. This will also enable the students to prepare report writing and framing Research proposals.

#### **Course Outcomes**

- Students who complete this course will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.
- This course will help them to select an appropriate research design.
- With the help of this course, students will be able to take up and implement a research project/ study.
- The course will also enable them to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate students' prosperity in higher education.
- The Students will develop skills in qualitative and quantitative data analysis and presentation.
- Students will be able to demonstrate the ability to choose methods appropriate to research objectives.

#### **UNIT I: Introduction, the Purpose and Product of Research 10**

What is research?, Evaluating Research, The 6Ps of research, Reasons for doing Research, possible products, Finding and choosing research topics, evaluating the purpose and product of research.

#### **UNIT II: Overview of the Research Process, Internet Research 10**

A model of the research process, Alternative models of the research process, evaluating the research process, Background of the Internet and WWW, Internet research topics, The Internet and a literature review, The Internet and research strategies and methods, Internet research, the law and ethics.

#### **UNIT III: Reviewing the literature, Surveys and Design Creation 10**

Purpose of literature review, literature resources, The Internet and literature reviews, conducting literature reviews, evaluating literature reviews, Define Surveys, Planning and Designing surveys, the internet and surveys, Example of Surveys, Defining design and creation, Planning and conducting design and creation research, Creative computing and digital art.

#### **UNIT IV: Experiments, Case studies, Action Research 10**

Defining experiments, Planning and conducting experiments, The internet and experiments, Defining case studies, Planning and conducting case studies, The internet case studies, Defining Action research, Planning and conducting Action research, The internet and Action research

#### **UNIT V: Interviews, Observations, Questionnaires 10**

Defining Interviews, Planning and conducting Interviews, Group Interviews Internet based Interviews, Defining Observations, Planning and conducting systematic Observations, Planning and conducting participant Observations, The internet and Observations.

**UNIT VI: Quantitative data analysis, Qualitative data analysis and Presentation of Research**

**10**

Defining Quantitative data analysis, Types of Quantitative data analysis, Data coding, Visual aids for Quantitative data analysis, Using statistics for Quantitative data analysis, Qualitative data analysis- Introduction, Analysis textual data, Analyzing non-textual qualitative data, Grounded theory, Presentation of Research- writing up the research, conference paper presentations, Posters and exhibitions, software demonstrations, Presenting yourself, PhD vivas, Research Ethics, Plagiarism, software to detect plagiarism

**References:**

1. Researching Information System and Computing by Briony J Oates, SAGE Publications, ISBN 978-81-7829-759-0

**Course Code: SSEC-451**  
**Paper Title: Windows Programming with C#.NET**

**Course Objectives:**

1. To provide the knowledge of .Net framework along with C#.Net language
2. To skill the students for developing windows base applications.

**Course Outcome:**

1. Students will able to develop simple as well as complex applications using .Net framework
2. Students will learn to use web applications for creating GUI based programs.

**Unit-I: Introduction to C# and .NET Framework 10**

Overview of C# language features, Introduction to .NET Framework and its components, Setting up the development environment (Visual Studio), What is Event-Driven Programming?, Installing Visual Studio Creating a Simple .Net Application, Overview of Visual Studio IDE, The Menu, The Toolbars, The Toolbox Intellisense windows Common Language Runtime(CLR)

**Unit-II: Working with Forms and Controls. 8**

Creating and Customizing Windows Form, Form Controls: Label and TextBox Control, Button, CheckBox, RadioButton, ListBox, ComboBox, DataGridView, MenuStrip, Panel, PictureBox, Tab Control, TreeView Control, DateTimePicker control, Dialog Boxes: ColorDialog, FileDialog, FontDialog, OpenFileDialog, PageSetupDialog, PrintDialog, PrintPreviewDialog, SaveFileDialog,

**Unit- III: Functions and Arrays 6**

C# built in Functions, Custom Functions, String Functions, Call by Value & Call by Reference, Out Parameter, Array and ArrayList and Jagged Array, Sorting Arrays

**Unit-VI: Controlling the programming flow 6**

The If, If-else, Else-if Statement, Switch Case Statement, Looping: While, Do while, The For loop, For Each Loop, Nested Loops

**Unit-V: Advanced Programming & ADO.Net 10**

Reusable libraries: C# Data collection classes, interfaces, Creating & using Namespace(DLL library), Properties, Indexers, Delegates, Multicast Delegates, Custom Events, Multithreading, Exception Handling through Try-Catch-Finally Block, Printing in C#, MDI forms,

**Unit-VI: ADO.Net 10**

Architecture of ADO.NET, Advantages of ADO.Net, Developing a Simple ADO.NET Based Application, Data binding: Displaying data in a data grid, Performing Select, Insert, Update and Delete operations on windows form, Create a simple application with Connected Data Access, Create a application with Disconnected Data Access Through Dataset Objects, Database connectivity with MS Sql Server

**Reference Books:**

1. Windows Forms Programming with C#, Author By ERIK BROWN, Published by MANNING - ISBN 1930110-28-6
2. Programming in C#, Autor By E Balagurusamy, Published by Mc Graw Hill
3. Visual C#.Net, Author By C Muthu, Published by Mc Graw Hill

**Course Code: SSEC-452**  
**Paper Title: Advanced Java Programming**

**Course Objectives:**

1. To develop background knowledge as well as core expertise AWT, Frames, Applet etc.
2. To understand the dynamic web page creation and provide knowledge for creating Dynamic websites.

**Course outcome:**

After completion of this course students will be able to

1. Impart the knowledge on basics concepts of multithreading programming.
2. Outline the various AWT classes.

**UNIT-I: Introduction to Java and Object Oriented Programming** **10**

Why Java is important for Internet, Java Magic: Byte Code, Java Buzzwords, Simple program of java, Using super keyword, Dynamic method dispatch, Final class and Methods, Packages, Access Protections, Interfaces, Exception Handling Fundamentals, Working with finally clause.

**UNIT-II: Multithreading, Applet and Event Handling** **10**

Multithreading Basics, Creating and Running a Thread, Thread life cycle, Thread Priorities, Thread synchronization, Applet Fundamentals, Applet Architectures, An Applet skeleton, The HTML APPLET tag, Passing parameters to Applet, Event class, Event Types and Listener, Action Event, Mouse Event, Key Event, Windows Event.

**UNIT-III: Network Management (SNMP)** **8**

Managing an Internet, The Danger of Hidden Features, Network Management Software, Clients, Servers, Managers and Agents, Simple Network Management Protocol, Fetch-Store Paradigm, The MIP and Object Names, The Variety of MIB Variables, MIB variables that correspond to arrays.

**UNIT-IV: Java technologies** **6**

Graphics, JFC-JAVA foundation classes, swing, images, java 2d graphics, internationalization, Communication and Networking, TCP Sockets, UDP Sockets, java.net, java security, Object serialization, Remote method serialization.

**UNIT V: Introduction to AWT & SWING** **8**

AWT Classes, Windows Fundamentals, Working with Frame window, Working with Graphics, Working with Colors & Fonts, Layout Managers, Swing & Its Features, JApplet, Icons & Labels Button & Label, Text Field & Toggle Buttons, Checkboxes, Radio buttons, Combo Box & Lists, Scroll panes, Trees, Tables, Menu Bars & Menus, Tool Bars, Dialog Boxes, File Dialog, Progress Bar, Choosers

**UNIT VI: Java Beans & JDBC** **10**

Introduction & Advantages of JavaBeans, Application Building Tools, Bean Development Kit, JAR Files, Developing Simple Bean Using the BDK, The Java Bean API, Introduction to JDBC, Types Of JDBC Connectivity, Accessing Relational Database from java Programs, Establishing database Connection.

**Reference Books:**

1. Java Complete Reference by Herbert Schildt Tata McGraw-Hill.Publisher: Sams 2000.
2. Mastering Java2 J2SE1.4 by John Zukouski PBP Publication
3. Java How to Program By H.M Deitel, P.J. Deitel 6th Edition.

**Course Code: SSEC-453**  
**Paper Title: Programming in Python**

**Course Objectives:**

1. To understand why Python is a useful scripting language for developers.
2. To define the structure and components of a Python program.
3. To understand programming constructs in Python.
4. To acquire Object Oriented Skills in Python
5. To develop the ability to write database applications in Python

**Course Outcomes:**

After successful completion of this course, learner will be able to

1. Write programs using Python programming constructs.
2. Design and Develop applications using Python programming.
3. Design object oriented programs with Python classes.
4. Use exception handling in Python applications for error handling.
5. Design and Develop applications connecting with database.

**UNIT-I: Introduction and basic control structure of Python**

**10**

Introduction and Features of Python, Data Types, Variables, Operators, Control Structures: Loops and Decision.

**UNIT II: Data Types and Classes**

**10**

Data Types: Numerical, String, Set, Dictionary, List, Tuple, Classes and Objects, Functions and Arguments, Inheritance, Polymorphism.

**UNIT III: Modularization and Exceptions**

**10**

Standard Modules, Packages, Exception raising, Exception Handling, Error Processing.

**UNIT IV: Object Oriented Design**

**10**

Programming types, Object Oriented Programming, Inheritance and types of inheritance, Polymorphism.

**UNIT V: Database Connectivity with MySQL**

**10**

Getting MySQL for Python, connecting with database, Passing Query to MySQL. GUI using Tkinter Module, Creating Label, Text, Button, Info Dialog Boxes, Radio button, Check button, Importing MySQL for Python, connecting with database, Passing a query to MySQL.

**UNIT VI: Web Development using Python**

**10**

Django Installation, Creating Project, Creating Application, Templates and Models, Data Manipulation, Django Admin, Django Syntax- variables, tags, if-else, loops, Database Connection with MySQL.

**Reference Books: -**

1. Learning Python-Mark Lutz-O'Reilly 5th edition
2. MySQL for Python-Albert Lukaszewski-Packet publication 1st edition
3. Django 2 by Example (Build powerful and reliable Python web applications from scratch)-Antonio Mele

**Course Code: SSEP-451**

**Course Title: Lab 1: C# .NET Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEP-452**

**Course Title: Lab 2: Java Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEP-453**

**Course Title: Lab 3: Python Lab**

- At least 15 Practical Based on Elective Subject.

**Course Code: SSEPE-451 A**  
**Paper Title: Software Testing**

**Course Objectives:**

- i. To develop software testing skills and test plans execution skills.
- ii. To understand software testing techniques and its application in Software development.
- iii. To enhance skills of designing and testing software.
- iv. To learn technical skills required for quality assurance of software.

**Course Outcomes:**

- i. Ability to learn various methods of software development.
- ii. Ability to apply various software testing techniques
- iii. Ability to evaluate cost of software testing
- iv. Ability to implement different software testing according to types of software.

**Unit –I: Quality concepts 6**

Concept of Quality, Software Quality, McCall’s Quality Factors, ISO 9126 Quality Factors, Targeted Quality Factors, Cost of Quality, Quality and Security, Quality Control, Quality Assurance

**Unit –II: Software Quality Assurance 6**

Software Quality Assurance, Software Reviews and its type, Formal Technical Reviews, Software Reliability, Software Quality Assurance Plan

**Unit –III: Software Testing Strategies 8**

A Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, The Art Of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basic Path Testing, Control Structural Testing, Black Box Testing

**Unit –IV: Test Cases 10**

Test plan, Test plan Benefits, Test Plan Template, Test Scope, Test Objectives, Assumptions, Risk, Risk Analysis , Risk management, Test Schedule and Planned Resources, Test case planning overview, Test Design, Test Cases, Test Procedures, Building Test Data, Equivalence Partitioning, Boundary Value analysis, Test case Organization and Tracking

**Unit –V: Webapps for Testing 10**

Testing Concepts for WebApps, An Overview-The Testing Process, Content Testing, User interface Testing, Navigation Testing, Security Testing

**Unit –VI: Product Metrics 10**

A frame work for product metrics, Metrics for the requirements mode, Metrics for design mode, Metrics for source code, Metrics for testing

**Reference books:-**

1. Software Engineering –A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808
2. Software Engineering –A Practitioner's approach, Fifth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2005)
3. Software Testing Concepts and Tools NageswaraRoo Dreamtech Publication

**Course Code: SSEPE-451 B**  
**Paper Title: Data Structures**

**Course Objectives:**

1. To develop skills in data structure.
2. To understand Stacks, Queue and Linked Lists, Trees, Graphs.

**Course Outcomes:**

1. Ability to learn various methods of data structure.
2. Ability to apply various Algorithms and Flowcharts
3. Ability to perform operations of Stack, Array etc.

**Unit -I Introduction to Data Structures:**

Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion. Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multidimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings

**Unit-II Stacks and Queue**

Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

**Unit-III Linked Lists**

Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List

**UNIT IV: Trees**

Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

**UNIT V: Graphs:**

Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.

**UNIT VI: Searching and Sorting:**

Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort. Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing

**Reference Books**

1 Data Structure Seymour Lipschutz Mcgraw Hill

2 An Introduction to Data Structure with Application jeanpaul, tremblay paul, g. sorensen tata Mcgraw Hill

**Course Code: SSEPE-451 C**  
**Paper Title: Statistical Methods**

**Course Objectives:**

1. To develop skills in Statistical Methods.
2. To understand the concept of Measures of Central Tendency.

**Course Outcomes:**

1. Ability to learn various Statistical Methods.
2. Ability to calculate Probability.

**UNIT I: Introduction**

**6 Lectures**

Definition of Statistics, Importance of Statistics, Limitation of Statistics, Scope of Statistics (Computer Science, Industry, Economics, Social Science)

**UNIT II: Fundamental of Statistics**

**10 Lectures**

Collection of Data, Types of Data, Construction of Frequency, Cumulative and Relative Frequency distributions. Graphical representation of Frequency distribution: Histogram, Frequency Polygon, Frequency Curve and Cumulative Frequency curves, Diagrammatic representations: Simple bar, Subdivided bar and Pie diagrams

**UNIT III: Measures of Central Tendency**

**10 Lectures**

Concept of central tendency, Arithmetic Mean: Definition, Formulae and computation for ungrouped and grouped data, Merits and Demerits. Weighted Arithmetic Mean, Median: Definition, Formulae and Computation for ungrouped and grouped data, Merits and Demerits Mode: Definition, Formulae and Computation for ungrouped and grouped data, Merits and Demerits.

**UNIT IV: Measures of Dispersion:**

**10 Lectures**

Concept of Dispersion. Range: Definition, Formulae and Computation for ungrouped and grouped data. Standard Deviation: Definition, Formulae and Computation for ungrouped and grouped data. Variance: Definition, Formulae and Computation for ungrouped and grouped data Coefficient of variance: Definition, Formulae and Computation for ungrouped and grouped data.

**UNIT V: Probability**

**8 Lectures**

Permutation and combination, Sample space, Events and Types of events. Classical definition of probability and axioms of probability, Theorems on Probability: i)  $0 \leq P(A) \leq 1$  ii)  $P(A) + P(A') = 1$  iii)  $P(A \cup B) = P(A) + P(B)$  iv)  $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

**UNIT VI: Correlations and regressions**

**6 Lectures**

Definition of Correlation & Types, Karl Pearson's coefficient of correlations for ungrouped data and problems, Definition of Regression.

**References:**

- 1) Fundamental of Statistics S. C. Gupta Himalaya Publication (6th revised & Enlarged Edition)
- 2) Statistical Methods S. P. Gupta Sultan Chand & Sons Publication (37th Revised Edition)

SDSCOJ-451	On Job Training , Internship/ Apprenticeship or Field Project
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On Job Training , Internship/ Apprenticeship or Field Project will be covered

