Pune Vidyarthi Griha's
College of Science, Pune -09

PVGCOS	
NAAC Cycle 2	
2.6.1	
2021-22	

CO –POs Of Computer Science						
Cour se type	**Paper Code**	**Paper Title**	**Course Type**	**Paper Code**	**Paper Title**	
DSEC - I	CS-351	Operating Systems – I	DSEC - I	CS-361	Operating Systems – II	
	CS-352	Computer Networks – II		CS-362	Software Testing	
	CS-357	Practical course based on CS 351		CS-367	Practical course based	
DSEC - II	CS-353	Web Technologies – I	DSEC - II	CS-363	Web Technologies – II	
	CS-354	Foundations of Data Science		CS-364	Data Analytics	
	CS-358	Practical course based on CS 353 and CS 354		CS-368	Practical course based andCS 364	
DSEC - III	CS-355	Object Oriented Programming usingJava - I	DSEC - III	CS-365	Object Oriented Progra usingJava - II	
	CS-356	Theoretical Computer Science		CS-366	Compiler Construction	
	CS-359	Practical Course based on CS 355		CS-369	Practical Course based	
SECC - I	CS-3510	Python Programming	SECC - III	CS-3610	Software Testing Tools	
SECC - II	CS-3511	Blockchain Technology	SECC - IV	CS-3611	Project	

Savitribai Phule Pune University T.Y.B.Sc.
(Computer Science)
Course Title : Operating Systems – I

Course Objectives:
1. To understand the concept of operation system and its principle
2. To study the various functions and services provided by operating system
3. To understand the notion of process and threads

Course Outcomes: After completion of this course students will be able to understandthe concept of
1. Processes and Thread Scheduling by operating system
2. Synchronization in process and threads by operating system
3. Memory management by operating system using with the help of various schemes

Course Code: DSEC - I   Course Code : CS - 352
Course Title :Computer Networks - II

Course Objectives
- To understand different protocols of application layer.
- To understand concepts of multimedia.
- Explore the different methods used for Network/INTERNET security.

Course Outcomes

On completion of the course, student will be able to–
- Student will understand the different protocols of Application layer.
- Develop understanding of technical aspect of Multimedia Systems
- Develop various Multimedia Systems applicable in real time.
- Identify information security goals.
- Understand, compare and apply cryptographic techniques for data security.

Course Type:DSEC – II   Course Code: CS - 353
Course Title : Web Technologies - I

Course Objectives
- To Design dynamic and interactive Web pages.
- To Learn Core-PHP, Server Side Scripting Language
- To Learn PHP-Database handling

Course Outcomes

On completion of the course, student will be able to–
- Understand how to develop dynamic and interactive Web Page

Course Type:DSEC – II   Course Code: CS - 354
Paper Title : Foundations of Data Science

Course Objectives
- Provide students with knowledge and skills for data-intensive problem solving and scientific discovery
- Be prepared with a varied range of expertise in different aspects of data science such as data collection, visualization, processing and modeling of large data sets.
- Acquire good understanding of both the theory and application of applied statistics and computer science based existing data science models to analyze huge data sets originating from diversified application areas.
- Be better trained professionals to cater the growing demand for data scientists in industry.

Course Outcomes

On completion of the course, student will be able to–
- Perform Exploratory Data Analysis
- Obtain, clean/process, and transform data.
- Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.
- Demonstrate proficiency with statistical analysis of data.
- Present results using data visualization techniques.
- Prepare data for use with a variety of statistical methods and models and recognize how the quality of the data and the means of data collection may affect conclusions.

Course Type:DSEC – III   Course Code: CS – 355
Course Title: Object Oriented Programming using Java - I

Course Objectives
- To learn Object Oriented Programming language
- To study various java programming concept like Interface, File and Exception Handling etc.
- To design User Interface using Swing and AWT

Course Outcomes
On completion of the course, student will be able to–
- Understand the concept of classes, object, packages and Collections.
- To develop GUI based application.

Course Type: DSEC - III   Course Code: CS - 356
Paper Title: Theoretical Computer Science

Course Objectives
- To understand the Finite Automata, Pushdown Automata and Turing Machine.
- To understand the Regular Language, Context Free Language, Context Sensitive Language and Unrestricted Language.
- To understand the relation between Automaton and Language

Course Outcomes
On completion of the course, student will be able to–
- Understand the use of automata during language design.
- Relate various automata and Languages.

Course Type: DSEC - I   Course Code: CS – 357
Course Title : Practical Course based on CS - 351

Course Objectives:
1. To understand the concept of process scheduling with the help of simulation.
2. To study the concept demand paging concepts in operating system.
3. To understand the working of operating system shell.

Course Outcomes: After completion of this course students will be able to understand the concept of
1. Process synchronization
2. Processes and Thread Scheduling by operating system
3. Memory management by operating system using with the help of various schemes

Course Type: DSEC - II   Course Code: CS - 358
Course Title : Practical Course based on CS - 353 and CS - 354

Course Objectives:
- To Design dynamic and interactive Web pages.
- To Learn Core-PHP, Server Side Scripting Language
- To Learn PHP- Database handling
- To apply statistical, data preprocessing and visualization techniques on data sets

Course Outcomes:
- Understand how to develop dynamic and interactive Web Page
- Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions.
- Perform exploratory data analysis

Course Type: DSEC - III   Course Code: CS - 359
Course Title : Practical Course based on CS - 355

Course Objectives:
Covers the complete scope of the syllabus.
1. Bringing uniformity in the way course is conducted across different colleges.
2. Continuous assessment of the students.

Course Outcomes:
1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
2. Read and make elementary modifications to Java programs that solve real-world problems.
3. Validate input in a Java program.

Course Type: SECC – I   Course Code : CS-3510
Course Title: Python Programming

Course Objectives
1. To introduce programming concepts using python
2. Student should be able to develop Programming logic using python
3. To develop basic concepts and terminology of python programming
4. To test and execute python programs

Course Outcomes
On completion of the course, student will be able to–
- ☐ Develop logic for problem solving
- ☐ Determine the methods to create and develop Python programs by utilizing the data
- ☐ structures like lists, dictionaries, tuples and sets.
- ☐ To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
- ☐ To write python programs and develop a small application project

Course Type: SECC – II   Course Code : CS-3511
Course Title: Blockchain Technology

Course Objectives
1. Understand what and why of blockchain technology.
2. Explore major components of blockchain.
3. Learn about Bitcoin, Cryptocurrency and Ethereum.
4. To learn blockchain programming using Python, Flask Web Framework, and HTTP client Postman.

Course Outcomes
On completion of the course, student will be able to–
1. Learn the fundamentals of Blockchain Technology.
2. Learn Blockchain programming
3. Basic knowledge of Smart Contracts and how they function.

Course Type: DSEC - IV   Course Code: CS – 361
Course Title : Operating Systems-II

Course Objectives:
1. To understand the issue of Deadlocks in Process management.
2. To understand the concept of File system management & disk scheduling
3. To study the concept of distributed and mobile operating systems

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Course Outcomes: After completion of this course students will be able to understand the concept of
1. Management of deadlocks and File System by operating system
2. Scheduling storage or disk for processes
3. Distributed Operating System and its architecture and the extended features in mobile OS.

Course Type: DSEC - IV   Course Code: CS – 362
Course Title : Software Testing

Course Objectives:
- To provide the knowledge of software testing techniques
- To understand how testing methods can be used as an effective tools in quality assurance of software.
- To provide skills to design test case plan for testing software.
- To provide knowledge of latest testing methods

Course Outcomes:
- To understand various software testing methods and strategies.
- To understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software.
- To design test cases and test plans, review reports of testing for qualitative software.
- 4. To understand latest testing methods used in the software industries.

Course Type:DSEC – V   Course Code: CS - 363
Course Title : Web Technologies - II

Course Objectives
• To Learn different technologies used at client Side Scripting Language
• To Learn XML and XML parsers.
• To One PHP framework for effective design of web application.
• To Learn Java Script to program the behavior of web pages.
• To Learn AJAX to make our application more dynamic.
• Framework has

Course Outcomes

On completion of the course, student will be able to–

• Build dynamic website.

• Using MVC based framework easy to design and handling the errors in dynamic website.

Course Type:DSEC – V   Course Code: CS - 364
Course Title : Data Analytics

Course Objectives

- Deploy the Data Analytics Lifecycle to address data analytics projects.
- Develop in depth understanding of the key technologies in data analytics.
- Apply appropriate analytic techniques and tools to analyze data, create models, and identify insights that can lead to actionable results.

Course Outcomes

On completion of the course, student will be able to–

- Use appropriate models of analysis, assess the quality of input, and derive insight from results.
- Analyze data, choose relevant models and algorithms for respective applications
- Understand different data mining techniques like classification, prediction, clustering and association rule mining
- Apply modeling and data analysis techniques to the solution of real world business problems

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Course Type: DSEC – VI Course Code : CS - 365
Course Title : Object Oriented Programming using Java – II

Course Objectives

- To learn database programming using Java
- To study web development concept using Servlet and JSP
- To develop a game application using multithreading
- To learn socket programming concept

Course Outcomes

On completion of the course, student will be able to–

- To access open database through Java programs using Java Data Base Connectivity (JDBC) and develop the application.
- Understand and Create dynamic web pages, using Servlets and JSP.
- Work with basics of framework to develop secure web applications.

Course Type: DSEC - VI Course Code: CS - 366
Course Title: Compiler Construction

Course Objectives
- To understand design issues of a lexical analyzer and use of LEX tool.
- To understand design issues of a parser and use of YACC tool.
- To understand and design code generation and optimization techniques.

Course Outcomes
On completion of the course, student will be able to–
- Understand the process of scanning and parsing of source code.
- Learn the conversion code written in source language to machine language.
- Understand tools like LEX and YACC.

Course Type: DSEC- IV   Course Code: CS - 367
Course Title : Practical Course based on CS - 361

Course Objectives:
1. To implement Banker's algorithm for Deadlocks in Process management.
2. To simulate File system management
3. To study and implement various algorithms of disk scheduling

Course Outcomes: After completion of this course students will be able to understand the concept of
1. Management of deadlocks by operating system
2. File System management
3. Disk space management and scheduling for processes

Course Type: DSEC - V   Course Code: CS - 368
Course Title : Practical Course based on CS - 363 and CS - 364

Course Objectives:
- To Learn different technologies used at client Side Scripting Language
- To Learn XML and XML parsers.
- To One PHP framework for effective design of web application.
- To Learn Java Script to program the behavior of web pages.
- To Learn AJAX to make our application more dynamic.

Framework has some utility features that make easy to write API in more efficient way than
Core PHP

Course Outcomes:
- Build dynamic website.
- Using MVC based framework easy to design and handling the errors in dynamic website.

Course Type: DSEC - VI   Course Code: CS – 369
Course Title : Practical Course based on CS - 365

Course Objectives:
1. Covers the complete scope of the syllabus.
2. Bringing uniformity in the way course is conducted across different colleges.
3. Continuous assessment of the students.
4. Advanced Java is designed to develop web based, network centric, Enterprise level applications

Course Outcomes:
1. To Learn database Programming using Java
2. Understand and Create dynamic web pagesusing Servlets and JSP.
3. Work with basics of framework to develop secure web applications

Course Type: SECC - III   Course Code: CS - 3610
Course Title: Software Testing Tools

Course Objectives:
- To provide the knowledge of software testing methods and strategies.
- To understand how testing methods can be used as an effective tool in quality assurance of software.
- To provide skills to design test case plan for testing software.
- 4.To provide knowledge of latest testing tools

Course Outcomes:
- To understand various software testing methods and strategies.
- To understand a variety of software metrics and identify defects and managing those defects for improvement in quality for given software.
- To design test cases and test plans, review reports of testing for qualitative software.
- 4. To understand latest testing tools used in the software industries.

Savitribai Phule University of PuneM.Sc (Computer Applications)
Sem -3

CourseCode	Course
CA- CCTP -7	Mobile ApplicationDevelopment using Android
CA- CCTP-8	Internet of Things
CA- CCTP-9	Artificial Intelligence
CA- CBOTP-3 A	Python Programming

CA- CBOPP-3A	Python Programming Laboratory	
CA- CBOTP-3 B	Big Data	
CA- CBOPP-3B	Big Data Laboratory	
CA- CBOTP-3 C	DJango	
CA- CBOPP-3C	DJango Laboratory	
CA- CCPP-3	Android ProgrammingLaboratory	

Savitribai Phule Pune University
M.Sc.(Computer Applications) (2019 Course)
Course Type : CC Course Code : CA- CCTP-7
Course Title : - Mobile Application Development Using Android

Course Prerequisite:
 Knowledge of JAVA programming language and OOP concept.
 Familiar with the network Protocol stack

Course Objectives:
 Gain knowledge about different mobile platform and application development
 To know the programming using An

Course Type : CC Course Code : CA- CCTP-8
Course Title : Internet of Things (IoT)

Course Objectives:
 To Study Basic and Advanced Concepts of IoT with its Architecture
 To learn Technical aspects of IoT.

Course Outcomes:
On completion of the course, student will be able to–
Develop small Microcontroller based IoT application
Apply theoretical knowledge in real world scenario

Course Type : CC Course Code : CA- CCTP-9
Course Title : Artificial Intelligence

Prerequisite Courses:
 Concepts of Mathematical logic, Data structures, and Design and Analysis of algorithms
 Strong will to learn machine learning concepts.

Course Objectives:
 To provide a strong foundation of fundamental concepts in Artificial Intelligence
 To provide a basic exposure to the goals and methods of Artificial Intelligence
 To enable the student to apply these techniques in applications which involve perception, reasoning, and learning

Course Outcomes:
On completion of the course, student will be able to–
 Discuss the core concepts and algorithms of advanced AI
 Apply the basic principles, models, and algorithms of AI to recognize, model,

and solve problems in the analysis and design of information systems.

Course Type : CBOTP Course Code : CA- CBOTP -3 A
Course Title : Python Programming

Course Objectives:

☐ To introduce various concepts of programming to the students using Python.

☐ Students should be able to apply the problem solving skills using Python

Course Outcomes:

On completion of the course, student will be able to–

☐ Express proficiency in the handling of strings and functions.

☐ Determine the methods to create and manipulate **Python programs** by utilizing the data structures like lists, dictionaries, tuples and sets.

☐ Identify the commonly used operations involving file systems and regular expressions

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Course Type : CBOP Course Code : CA -CBOTP-3 B
Course Title : Big Data

Course Objectives:

1. To Understand the Big Data challenges & opportunities, its applications
2. To gain conceptual understanding of Hadoop Distributed File System.
3. To study use of Big data in real life applications

Course Outcomes: Students will be able to

☐ Describe Big data and its challenges and opportunities

☐ Compare and contrast NoSQL with RDBMS

☐ Define components of Hadoop Ecosystem

Course Type : CBOP Course Code : CA- CBOTP -3 C
Course Title : DJango

Course Objectives:

☐ To Study Django Architecture

☐ Learn MVC (Models, Views & Templates)

Course Outcomes:

On completion of the course, student will be able to–

☐ Design Build and deploy robust Django web apps

☐ Integrate with RESTful web services

Industrial Training/on-campus/ Projects

Course Objectives:

• To develop skills in the application of theory to practical work situations

• To provide students the opportunity to test their interest in a particular career

• To expose students to real work environment experience, gain knowledge in writing report in technical works/projects.

• To build strength, teamwork spirits and self-confidence in student.

Course Outcomes:

On completion of the Industrial Training Period, student will be able to–
• Apply fundamental principles of the subjects to solve real world problems.
• Become master in at least one specialized area
• Able to communicate efficiently
• Ability to identify, formulate and model problems and find solutions .

Savitribai Phule University of PuneM.Sc (Computer Science)

Year/ Sem	Course Type	CourseCode	Course Name
Year Sem-III	Core Compulsory Theory Paper	CSUT231	Software Architecture and Design Patterns
		CSUT232	Machine Learning
		CSUT233	Web Frameworks
	Choice Based Optional Paper	CSDT234A	Big Data Analytics
		CSDP234A	Big Data AnalyticsPractical
		CSDT234B	Web Analytics
		CSDP234B	Web AnalyticsPractical
		CSDT234C	Project
		CSDP234C	Project relatedAssignments
	Core Compulsory Practical Paper	CSUP235	Practical on CSUT231, CSUT232and CSUT233

Savitribai Phule Pune University
M.Sc.(Computer Science) (2019 Course)
CSUT231- Software Architecture and Design Patterns

Course Objectives:
• To introduce students to the basic concepts and techniques of SADP.
• To write java programs using Design Pattern and Frameworks to create reusable and flexible software systems.
• Use of patterns and architectures for solving practical problems.
• To understand about design pattern.
• To understand about the process of deploying web apps using specific Frameworks.

Course Outcomes:
☐ Recognize the characteristics of patterns that make it useful to solve real-world problems.
☐ Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
☐ Able to use specific frameworks as per applications need.

☐ Design java application using design pattern techniques.

CSUT232 Machine Learning

Course Objectives:
• To introduce students to the basic concepts and techniques of Machine Learning.
• To write python programs using machine learning algorithms for solving practical problems.
• To understand about Machine Learning Library and use cases.
• To understand about the process of deploying ML model.

Course Outcomes:
☐ Recognize the characteristics of machine learning that make it useful to real-world problems.
☐ Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
☐ Able to estimate Machine Learning models efficiency using suitable metrics.
☐ Design application using machine learning techniques.

CSUT233- Web Frameworks

Course Objectives:
• To introduce students for modern web technologies.
• To learn and use server side programming using Node.js
• To understand asynchronous programming.
• To learn and understand web application in Django a Python Web Framework.

Course Outcomes:
☐ Students will be ready with the technology which is used widely in Industry as a part of full stack developer.
☐ Students will know the powerful way to develop the web application in Python.
☐ Students will understand what really the asynchronous programming.
☐ Build and deploy robust Django Web App.
☐ Integrate with Restful web services.

CSDT234A Big Data Analytics

Course Objectives:
1. To understand the Big Data challenges & opportunities, its applications
2. Understanding of concepts of map and reduce and functional programming
3. Gain conceptual understanding of Hadoop Distributed File System.
4. To solve the case studies related to real life situations
5. To bridge the gap between academics and industry needs.

Course Outcomes:
☐ Recognize the characteristics, applications of big data that make it useful to real-world problems.
☐ Process available data using big data tools hadoop file system and predict outcomes to solve given problem.

☐ Study & Design various case studies using big data tools/commands and analyse it.

CSDT234B- Web Analytics
Objectives:
1. Understand social media, web and social media analytics, and their potential impact.
2. Determine how to Leverage social media for better services and Understand usability metrics, web and social media metrics.
3. Use various data sources and collect data relating to the metrics and key performance indicators.
4. Identify key performance indicators for a given goal, identify data relating to the metrics and key performance indicators.

CSUP235 Practical on CSUT231, CSUT232 and CSUT233
Course Objectives:
• To write java programs using Design Pattern and Frameworks to create reusable and flexible software systems.
• To understand about the process of deploying web apps using specific Frameworks.
• To write python programs using machine learning algorithms for solving practical problems.
• To understand about the process of deploying ML model.

Course Outcomes:
☐ Able to use specific frameworks as per applications need.
☐ Design java application using design pattern techniques.
☐ Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
☐ Able to estimate Machine Learning models efficiency using suitable metrics.

B.Com. Degree course (Choice Based Credit System)(2019 Pattern)
Course Outcome
Financial Accounting

Objective of the Course:-

1. To impart knowledge of basic accounting concepts

2. To create awareness about application of these concepts in business world

3. To impart skills regarding Computerised Accounting

4. To impart knowledge regarding finalization of accounts of various establishments.

Business Economics-I

Objectives of the course:-

1. To impart knowledge of business economics
2. To clarify micro economic concepts
3. To analyze and interpret charts and graphs
4. To understand basic theories, concepts of micro economics and their application

Business Mathematics & Statistics -I

Objective of the Program

1. To introduce the basic concepts in Finance and Business Mathematicsand Statistics
2. To familiar the students with applications of Statistics and Mathematics in Business
3. To acquaint students with some basic concepts in Statistics.
4. To learn some elementary statistical methods for analysis of data.
5. The main outcome of this course is that the students are able to analyze the data by using some elementary statistical methods

BANKING & FINANCE- I

Objective of the Program

• To provide knowledge of fundamentals of Banking

• To create awareness about various banking concepts

• To conceptualize banking operations.

Marketing and Salesmanship- I

Objectives of the Course

1. To introduce the basic concepts in Marketing.
2. To give the insight of the basic knowledge of Market Segmentation and Marketing Mix
3. To impart knowledge on Product and Price Mix.
4. To establish link between commerce, business and marketing.
5. To understand the segmentation of markets and Marketing Mix.

To enable students to apply this knowledge in practicality by enhancing their skills in the field ofMarketing.

B.Sc(Animation) Degree course (Choice Based Credit System)
(2019 Pattern)
Course Outcome

ANM 101 Foundation of Art

Course Objectives:
- Understand the formal elements of art and/or design through art analysis and developcompetency in their application through studio practice.
- Learn how to use materials, tools and processes, effectively and safely, from a variety ofmedia (painting, sculpture, ceramic, photography), to create original works of art.
- Select appropriate media to convey specific artistic expression that effectively communicates the artist intent.
- Develop creative problem-solving strategies as a means to create strong artwork.
- Demonstrate critical skills through specific class projects.
- Present, discuss, and support artwork through individual and group critiques.

ANM 102 Basics of Animation

Course Objectives:

- This course will offer skill development in the use of software to develop storyboards and 2-dimentional animation including creating, importing and sequencing media elements tocreate multi-media presentations.
- Emphasis will be on conceptualization, creativity, and visual aesthetics.
- This course takes the students through various aspects of animation using a variety of 2 dimensional software.
- Developing concepts, storyboarding and production of several 2 dimensional animations will be accomplished.

ANM 103 Introduction to Digital Graphics – Image Editing (Vector)

Course Objectives:

- Understand and apply the basic principles, techniques, and algorithms for generating andinteracting with simple graphical objects on a display screen.
- Gain awareness of common computer graphics software.

ANM   104 Introduction to Programming Language

Course Objectives:
- Understand the concepts and terms used to describe languages that support the imperative, functional, object-oriented, and logic programming paradigms.
- Solve problems using the functional paradigm.
- Solve problems using the object-oriented paradigm.
- Solve problems using the logic programming paradigm.
- Critically evaluate what paradigm and language are best suited for a new problem.

ANM 105 Foundation of Art (Sketching) & Flipbook Animation

Course Objectives:
- Define the role of different medium and materials.
- Analyze importance of Perspective.
- Utilizing perspective drawing from real life
- Apply Light and shade in Art.
- Apply accurate anatomy characteristics in figure drawing.

ANM 106 Introduction to Digital Graphics – Image Editing (Vector)

Course Objectives:
- Have a proficiency in a broad range of design skills pertaining to publication design
- Have a basic understanding of typography, color, layout, tables, images, graphics, stylesand interactive elements.
- Be able to navigate Adobe Workspace, Set up a document, and work with pages.
- Understand how to work with frames, importing & linking graphics
- Be able to import and edit text, work with typography and style sheets
- Efficiently use color, transparencies, and tables
- Have an understanding of output, exporting and packaging.
- Be able to create a print-ready document.
- Have the ability to create a well-designed layout, brochure or other design materials for print or web.

ANM   107 Programming C

Course Objectives:
- Understand the concepts and terms used to describe languages that support the imperative, functional, object-oriented, and logic programming paradigms.
- Solve problems using the functional paradigm.
- Solve problems using the object-oriented paradigm.
- Solve problems using the logic programming paradigm.
- Critically evaluate what paradigm and language are best suited for a new problem.

ANM 108 3D Visualization (3DS MAX)

Course Objectives:

- To develop the skill & knowledge in 3D Modeling.
- Students will understand the knowhow and can function either as an entrepreneur or can take up jobs in the multimedia and animation industry, video studios, edit set-up and other Special Effects sectors