

APPROVED COPY
K.T.A.

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme(P19R)

With effect from AY 2021-22

Programme: Diploma in Information Technology (Sandwich Pattern) Term / Semester - IV

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)							
		L	P	TU	Total		Theory			PR	OR	TW	Total	
							TH	TS1	TS2					
CO19R206	Operating System	3	2		5	5	60	20	20			25*	25	150
CO19R308	Advance Programming in Java	2	4		6	6				50*			50	100
IT19R309 Optional 2	Microcontroller & Embedded systems	3	2		5	5	60	20	20	25*			25	150
IT19R307 Optional 2	Agile and DevOps													
IT19R401 Optional 1	Python Programming	3	2		5	5	60	20	20	25*			25	150
CO19R311 Optional 1	Next Generation Databases													
CO19R305	Computer Networks	3	2		5	5	60	20	20			50*		150
CO19R207	Software Engineering	3	---		3	3	60	20	20					100
IT19R305	User Interface Design	1	2		3	3				25*			25	50
IT19R306	Linux OS (MOOC)		3#		3#	3#								
	Total	18	17		35	35	300	100	100	125	75	150	850	

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill assessment. #Indicates Self, on- line learning Mode. @ indicates on line examination

Note: Duration of Examination-- TS1&TS2 -1 hour, TH- 2 hours, PR/OR - 3 hours per batch, SCA- Library -1 hour, Sports- 2hours, Creative Activity-1 hours
Self, on- line learning Mode through MOOCs/Spoken Tutorials/NPTEL/SWAYAM/FOSSEE etc.

Coordinator: *(Signature)*
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

(Signature)
Principal

Programme : Diploma in Computer Engineering and Information Technology (Sandwich Pattern)										
Course Code: CO19R308				Course Title: Operating System						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	02	--	05	60	20	20	--	25*	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

An Operating system is the basic system software that makes a computers system operational. It acts an interface between the user and the computer system. It is the essential software that manages computer hardware and software resources and provides common services for computer programs. Operating system is a core technology subject, it familiarizes the students with the concepts, structure and functions of Operating System. This course is aimed to teach and practice the concept of Operating System design.

Course Outcomes: Student should be able to

CO1	Demonstrate basic knowledge about operating system
CO2	Identify various OS components, services & structure
CO3	Describe the concept of Process and Threads
CO4	Apply various CPU Scheduling Algorithm, Use Banker's algorithm to find the Safe State for processes
CO5	Estimate efficiency of various memory management techniques
CO6	Illustrate File allocation and access methods

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Operating System Overview</p> <p>Introduction To Operating System : Concept, Components Of Computer System Role Of The Operating System Different Types Of Operating Systems- Batch Operating System, Multiprogramming System, Multitasking Operating System, Time Shared System, Multiprocessor Systems, Cluster</p>

	Systems, Distributed Systems, Real Time Systems, Open Source Operating System, Mobile Operating System
	Course Outcome: CO1 Teaching Hours : 5 Hrs Marks: 06 (R- 2, U-4, A-00)
2	<p>Operating System Components & Structure Operating System Components: Process Management, Main Memory Management, Secondary Storage Management, I/O System Management, File Management. Operating-System Services Operating System Structure: Simple Structure, Layered, Monolithic, Microkernel System Calls - Concept, Types & Uses of System Call: Process Control, File Management, Device Management, Information Maintenance, Communication.</p>
	Course Outcome: CO2 Teaching Hours : 08 Hrs. Marks: 10 (R-2 , U-4 , A-4)
3	<p>Process Management Process-Concept, Process States, Process Control Block Process Scheduling- Scheduling Queues, Schedulers, Context Switch. Inter-Process Communication- Introduction, Shared Memory System & Message Passing System Threads - Benefits, Users And Kernel Threads Multithreading Models - Many To One, One To One, Many To Many</p>
	Course Outcome: CO3 Teaching Hours : 06hrs. Marks: 08 (R-4 , U-4 , A-00)
4	<p>CPU Scheduling & Deadlock Scheduling Objectives, Concept, CPU And I/O Burst Cycles, Pre-Emptive & Non- Pre-Emptive Scheduling, Scheduling Criteria. Types Of Scheduling Algorithms –First Come First Served (FCFS). Shortest Job First (SJF). Shortest Remaining Time (SRTN), Round Robin (RR), Priority Scheduling, Multilevel Queue Scheduling Deadlock: System Model, Necessary Conditions Leading To Deadlocks Deadlock Handling Deadlock Prevention Deadlock Avoidance: Safe State, Resource Allocation Graph Bankers Algorithm And Example: Data Structure Of Banker's Algorithm, Safety Algorithm, Resource-Request Algorithm, Illustrative Examples</p>
	Course Outcome: CO4 Teaching Hours : 10 Hrs. Marks: 14 (R-2 , U-4 , A-8)
5	<p>Memory Management Background – Basic Memory Hardware, Address Binding, Logical & Physical Address Space, Swapping Contiguous Memory Allocation, Fragmentation. Paging, Page Table, Page Fault, Segmentation Virtual Memory – Concept, Demand Paging. Page Replacement Algorithms- First In First Out (FIFO), Least Recently Used (LRU), Optimal Page Replacement, Not Recently Used (NRU).</p>
	Course Outcome: CO5 Teaching Hours :10 Hrs. Marks: 14 (R-4 , U-4 , A-6)

6	File System
	File – Concepts, Attributes, Operations, Types, File System Structure, Access Methods – Sequential, Direct, Swapping File Allocation Methods- Contiguous, Linked, Indexed Directory Structure – Single Level, Two Level
Course Outcome: CO6 Teaching Hours :06 Hrs. Marks:08 (R-4, U-4, A-00)	

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Operating System Overview	2	4	--	06
2	Operating System Components & Services	2	4	4	10
3	Process Management	4	4	--	08
4	CPU Scheduling & Deadlock	2	4	8	14
5	Memory Management	4	4	6	14
6	File System	4	4	--	08
Total		18	24	18	60

List of experiments: Total 10-12 experiments(or turns) out of 15-16 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Compare various operating systems according to different criteria <ul style="list-style-type: none"> Operating systems to be considered - MS-DOS, Windows selected versions, OS/2, Mac OS, Windows 10, Linux, Android, iOS, etc. Criteria- Creator/ Produced by, Initial Public release, Target system type, Computer Architecture supported, File system supported, Kernel type, GUI default, Package management, Update management, Native APIs, Non-native APIs supported through subsystems, etc. 	2
2	2	CO2	Write a program using interrupt to clear the screen.	2
3	3	CO3	Use of Window's Task Manager to monitor the System Performance	2

4	4	CO4	<p>Write a program to implement First Come First Serve Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput. (Given the list of Processes, their CPU burst times)</p> <table border="1"> <thead> <tr> <th>Process</th> <th>Burst Time</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>6</td> </tr> <tr> <td>P2</td> <td>8</td> </tr> <tr> <td>P3</td> <td>7</td> </tr> <tr> <td>P4</td> <td>3</td> </tr> </tbody> </table> <p>(Course Teacher may give different Processes & Burst Times to students)</p>	Process	Burst Time	P1	6	P2	8	P3	7	P4	3	2																																																																				
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P2	8																																																																																	
P3	7																																																																																	
P4	3																																																																																	
5	5	CO5	<p>Write a program to implement First in first out (FIFO) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. (Course Teacher may give different reference Strings to students)</p> <p>1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6</p>	2																																																																														
6	6	CO6	Use /Differentiate various File Managers application software for Windows & Linux	2																																																																														
7	2,3	CO2. CO3	Write a program to demonstrate use of Process Control system, calls.	2																																																																														
8	4	CO4	<p>Write a program to implement Bankers Algorithm. Determine need matrix and Safety sequence for following system including 5 processes p0,p1,p2,p3,p4 and three resource types A,B,C</p> <table border="1"> <thead> <tr> <th rowspan="3">Process</th> <th colspan="3">Resource</th> <th colspan="3">Max</th> <th colspan="3">Available</th> </tr> <tr> <th colspan="3">Allocation</th> <th>A</th> <th>B</th> <th>C</th> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>P0</td> <td>0</td> <td>1</td> <td>0</td> <td>7</td> <td>5</td> <td>3</td> <td>3</td> <td>3</td> <td>2</td> </tr> <tr> <td>P1</td> <td>2</td> <td>0</td> <td>0</td> <td>3</td> <td>2</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P2</td> <td>3</td> <td>0</td> <td>2</td> <td>9</td> <td>0</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P3</td> <td>2</td> <td>1</td> <td>1</td> <td>2</td> <td>2</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P4</td> <td>0</td> <td>0</td> <td>2</td> <td>4</td> <td>3</td> <td>3</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>(Course Teacher may give different problems to students)</p>	Process	Resource			Max			Available			Allocation			A	B	C	A	B	C	A	B	C							P0	0	1	0	7	5	3	3	3	2	P1	2	0	0	3	2	2				P2	3	0	2	9	0	2				P3	2	1	1	2	2	2				P4	0	0	2	4	3	3				2
Process	Resource				Max			Available																																																																										
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P4	0	0	2	4	3	3																																																																												
9	4	CO4	Write a program to implement Shortest Job First Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput. (Given the list of processes, their CPU burst times and arrival times)	2																																																																														
10	4	CO4	Write a program to implement Shortest Remaining Time First Scheduling/ Round Robin (RR)/ Priority Scheduling/ Multilevel Queue Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput. (Given the list of processes, their CPU burst times and arrival times/ Priorities)	2																																																																														
11	2	CO2	Write a program which acts as a chat application between two users on the same computer, using shared memory concept.	2																																																																														
12	5	CO5	Write a program to implement Least recently used (LRU) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory	2																																																																														

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	--	1	--	2	--	2	--	--	2
CO2	2	--	1	--	2	--	2	--	--	2
CO3	2	3	3	3	3	2	2	2	3	2
CO4	2	3	3	3	3	2	2	2	3	2
CO5	2	3	3	3	3	2	2	2	3	2
CO6	1	--	1	--	2	--	2	--	--	2

CO Vs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	--	1	--	2	--	2	--	--	2
CO2	2	--	1	--	2	--	2	--	--	2
CO3	2	3	3	3	3	2	2	2	2	2
CO4	2	3	3	3	3	2	2	2	3	2
CO5	2	3	3	3	3	2	2	2	3	2
CO6	1	--	1	--	2	--	2	--	--	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms. Bhakti R. Khajone	Senior Project Engineer	WIPRO Technology, Pune
2	Mrs. Poonam Vegurlekar	Lecturer in Computer Engg.	Thakur Polytechnic Mumbai
3.	Smt Varsha M Aswar	I/C; HOD Computer Engg. Dept.	Govt. Polytechnic Mumbai
4.	Smt. Prajakta S. Sadafule	Lecturer in Computer Engg	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

I/C, Curriculum Development Cell

Head of Department
Department of Computer Engineering

Principal

Programme : Diploma in Computer Engineering and Information Technology (Sandwich Pattern)										
Course Code: CO19R401				Course Title: Advanced Programming in Java						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
02	04	--	06	--	--	--	50*	--	50	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

This course makes students learn higher level application programming using Java and make the use of latest features in it for better quality of software. This course includes Concurrency, Fork/Join Framework, Network Programming, Java Remote Method Invocation, web development in Java using Servlet and JSP technology, advanced web development using Hibernate and Spring Frameworks.

Course Outcomes: Student should be able to

CO1	Develop concurrent programs using Fork/ Join Framework.
CO2	Develop networking applications in Java using UDP and TCP/IP Sockets
CO3	Develop applications using Remote Method Invocation
CO4	Develop web applications using Servlets and JSP
CO5	Develop web applications such as Hibernate and Spring Frameworks

Course Content Details:

Unit No	Topics / Sub-topics
1	Concurrency SOLID Principles in Java Thread Class and Runnable Interface Creating a thread Thread.sleep Method Wait, notify and notifyAll Methods ThreadPool and ExecutorService ForkJoin Framework Collection.parallelStream Method

	Course Outcome: CO1 Teaching Hours : 5 hrs
2	Networking The Networking Classes and Interfaces InetAddress: Inet4Address and Inet6Address TCP/IP Client Sockets URL and URLConnection HttpURLConnection The URI Class Cookies TCP/IP Server Sockets Datagrams: DatagramSocket, DatagramPacket Classes Course Outcome: CO2 Teaching Hours : 4 hrs
3	Java Remote Method Invocation The RMI Architecture and Factory Design Pattern Stub and Skeleton The Remote Interface Naming Remote Objects, Implementation class RMIClient and RMIServer Client Server Application Development using RMI Course Outcome: CO3 Teaching Hours : 4 hrs
4	Servlets Creating Java Web Application Project in IDE Structure of Java Web Application Project Web Servers, Application Servers, Database Servers Configuring a Java Web Application The configuration file: web.xml Tags in web.xml Deploying a Java Web Application What Is a Servlet?, Servlet Lifecycle, Sharing Information Creating and Initializing a Servlet Writing Service Methods Filtering Requests and Responses Invoking Other Web Resources Accessing the Web Context Maintaining Client State Finalizing a Servlet Uploading Files with Java Servlet Technology Asynchronous Processing Nonblocking I/O Protocol Upgrade Processing Course Outcome: CO4 Teaching Hours : 5 hrs

5	<p>Java Server Pages Creating a Java Web Application Project for JSP Creating a simple JSP Page Using 'out' and Page Directives JSP expressions, variables, and declarations JSP-generated servlet Implicit Objects The JSP Life Cycle Scriptlets: What and Why Not? useBean, setProperty and getProperty Methods</p> <p>Course Outcome: CO4 Teaching Hours : 4 hrs</p>
6	<p>Persistence using Hibernate Framework Creating the Database Creating the Web Application Project with Hibernate Modifying the Hibernate Configuration File Creating the HibernateUtil.java Helper File Generating Hibernate Mapping Files and Java Classes Creating the FilmHelper.java Helper Class Creating the JSF Managed Bean Creating the Web Pages Running the Project Downloading the Solution Project Troubleshooting</p> <p>Course Outcome: CO5 Teaching Hours : 4 hrs</p>
7	<p>Spring Web MVC Setting up a New Project with Spring Web MVC Support Creating a Spring Web MVC Skeleton Project Running the Skeleton Project Overview of the Application Implementing a Service Implementing the Controller and Model Implementing the Views</p> <p>Course Outcome: CO5 Teaching Hours : 4 hrs</p>

List of experiments: (Note: 1. Mini Project is to be performed in parallel with the unit containing chosen topic. No separate time is allotted for Mini Project. 2. Use of IDE is mandatory.)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	<p>Blurring for Clarity (Basic Use of Fork/ Join Framework)</p> <p>Write code that performs a segment of the work. Your code should look similar to the following pseudocode:</p> <pre> if (my portion of the work is small enough) do the work directly else split my work into two pieces invoke the two pieces and wait for the results Wrap this code in a java.util.concurrent.RecursiveAction subclass. (java.util.concurrent.RecursiveAction class extends java.util.concurrent.ForkJoinTask class.) After your RecursiveAction subclass is ready, create the object that represents all the work to be done and pass it to the invoke() method of an instance of java.util.concurrent.ForkJoinPool class.</pre> <p>Write a code to blur an image. The original source image is represented by an array of integers, where each integer contains the color values for a single pixel. The blurred destination image is also represented by an integer array with the same size as the source.</p> <p>Performing the blur is accomplished by working through the source array one pixel at a time. Each pixel is averaged with its surrounding pixels (the red, green, and blue components are averaged), and the result is placed in the destination array. Since an image is a large array, this process can take a long time. Use concurrent processing on multiprocessor systems by implementing the algorithm using the fork/join framework. Write an appropriate code in main method to test the output.</p>	10
2	2	CO2	<p>Client Server Programming in Java</p> <p>Develop a Java Application in which TCPClient will send a text message and TCPServer will receive it.</p> <p>Add a functionality to the Java Application in 2.1 using which TCPServer will send a text message and TCPClient will receive it.</p> <p>Add a functionality to the Java Application in 2.2 using which TCPServer will advertise the TCPCLients associated with it.</p>	8
3	3	CO3	<p>Java Remote Method Invocation</p> <p>3.1 Create a distributed application using RMI where the client will handshake with the server by invoking the remote method</p>	8

			<p>public void sayHello() where client and server are on different hosts in the same network.</p> <p>3.2 Create a distributed application using RMI, where an RMI client can download a text file from the RMI server. Also identify the design pattern being used.</p>	
4	4	CO4	<p>Web Application Development using Servlet</p> <p>Create a Java Web Application in an IDE.</p> <p>Create a client side HTML web page to input your name from textbox and display "Hello <your name>" on the servlet after clicking on the "Login" button.</p> <p>Display the server port and protocol number in the browser in scrolling from right to left format.</p> <p>Create an HTML page login.html and create two textboxes on the HTML page named userName and password. After clicking on the 'Login' button the servlet will be displayed. It will show 'Login Successful' when userName and password are same else 'authentication failure' will be displayed.</p> <p>Create two HTML pages userProfile.html and errorPage.html. Modify 5.4 as follows: In case of successful login redirect to the page userProfile.html and display the username passed from login.html page on it.. In case of Authentication Failure redirect to errorpage.html.</p>	10
5	5	CO4	<p>Web Application Development using JSP</p> <p>Create a Java Web Application in an IDE.</p> <p>Create a JSP page registerEmployee.jsp for Employee Registration. The page will take inputs as First Name, Middle Name, Last Name, Email ID, Mobile No., Street, City, Pin code, Hire Date, Manager, Qualification, Designation and Experience. The page will also have a Submit button clicking on which all the inputs will be displayed on the userProfile.html page.</p> <p>Modify registerEmployee.jsp in 6.2 to store the inputs in the 'employees' table you have created in the database in 3.2.</p> <p>Create a Java Bean EmployeeBean with the properties given in 5.2.</p> <p>Modify registerEmployee.jsp to use theuseBean, getProperty and setPropety.</p>	8
6	6	CO5	<p>Using Hibernate in a Web Application</p> <p>Create a Database in any open source database like MySQL or Oracle.</p> <p>Create a Web Application Project with Hibernate.</p> <p>Modify the Hibernate Configuration File</p> <p>Create the HibernateUtil.java Helper File</p> <p>Generate Hibernate Mapping Files and Java Classes</p> <p>Create the FilmHelper.java Helper Class</p> <p>Create the JSF Managed Bean</p> <p>Create the Web Pages</p> <p>Run the Project</p> <p>Download the Solution Project</p> <p>Troubleshooting</p>	8

7	7	CO6	<p>Setting up a New Project with Spring Web MVC Support</p> <ol style="list-style-type: none"> Create a Spring Web MVC Skeleton Project in IDE Running the empty Skeleton Project and see the output. <p>Implementing a Service</p> <ol style="list-style-type: none"> Create a Java class for implementing a service e.g. orderAPizza(), generacBill(), etc. <p>Implementing the Controller and Model</p> <ol style="list-style-type: none"> Use a SimpleFormController to handle user data and determine which view to return. <p>Implementing the Views</p> <ol style="list-style-type: none"> Create two JSP pages. The first, which you will call nameView.jsp, serves as the welcome page and allows users to input a name. The other page, helloView.jsp, displays a greeting message that includes the input name. Begin by creating helloView.jsp 	8
8	All	All	<p>Mini Project</p> <p>Students are required to make groups of two and develop a mini project which is using at least 2 of the given technology in the course contents. For example,</p> <ol style="list-style-type: none"> Fork/ Join Framework Client Server Application TCP/ IP or UDP RMI Client Server Application Web Application using Servlet and Hibernate Web Application using JSP and Hibernate Web Application using Spring Web MVC and Hibernate. 	--
Total				60

E-References:

- <https://docs.oracle.com/javase/tutorial/essential/concurrency/index.html>
- <https://docs.oracle.com/javase/tutorial/essential/concurrency/forkjoin.html>
- <https://docs.oracle.com/javase/tutorial/essential/concurrency/QandE/questions.html>
- <https://docs.oracle.com/javase/tutorial/networking/overview/networking.html>
- <https://docs.oracle.com/javase/7/docs/platform/rmi/spec/rmiTOC.html>
- <https://docs.oracle.com/javase/7/tutorial/servlets.htm>
- <https://docs.oracle.com/en/middleware/fusion-middleware/weblogic-server/12.2.1.4/wbapp/basics.html#GUID-41C6F1CE-5E16-49CC-9623-70C4199FFD9F>
- <https://docs.oracle.com/javase/7/tutorial/jsf-page.htm>
- <http://hibernate.org/>
- <https://netbeans.org/kb/docs/web/hibernate-webapp.html>
- <https://spring.io/projects/spring-framework>
- <https://netbeans.org/kb/docs/web/quickstart-webapps-spring.html>

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

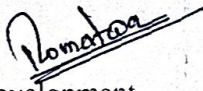
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	1	-	1	3	2	2	2
CO2	1	3	3	2	-	3	3	2	2	3
CO3	1	3	3	2	-	3	3	3	3	3
CO4	-	3	3	2	1	3	3	3	3	3
CO5	-	3	3	2	1	3	3	3	3	3


CO Vs PO and CO Vs PSO Mapping (Information Technology)

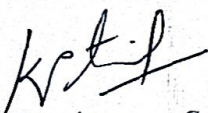
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	1	-	1	3	2	2	2
CO2	1	3	3	2	-	3	3	2	2	3
CO3	1	3	3	2	-	3	3	2	3	3
CO4	-	3	3	2	1	3	3	3	3	3
CO5	-	3	3	2	1	3	3	3	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms. Varshali Cholake-Landge	Senior Software Engineer	Volkswagen IT Services India Pvt. Ltd.
2	Ms. Rupali Komatwar	Lecturer in Computer Engineering	Government Polytechnic Arvi
3	Mr. Mohan Khedkar	Lecturer in IT	Government Polytechnic, Nashik
4	Ms. Jijnasa S. Patil (Curriculum Content Designer)	Lecturer in Computer Engineering	Government Polytechnic Mumbai

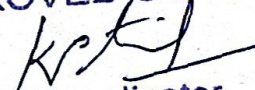
Coordinator, 
Curriculum Development,
Department of Computer Engineering

 →
Head of Department
Department of Computer Engineering


I/C. Curriculum Development Cell


Principal

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CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Information Technology and Computer Engineering (Sandwich Pattern)										
Course Code: IT19R304				Course Title: Microcontroller and Embedded system						
Compulsory / Optional: Compulsory for IT and Optional for CO										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	--	5	60	20	20	25*	---	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Microcontroller is heart of all domestic, industrial, consumer goods and other high end products. Automation in every field of life is being used and microcontroller is inbuilt element of these systems and devices. 8051 microcontroller architecture, peripheral interfacing to it and assembly language programming is covered in this course. Microcontroller is inbuilt element of embedded system. This course will also cover the concepts of embedded system. It covers Arduino and its programming.

Course Outcomes: Student should be able to

CO1	Comprehend the architecture and signal description of 8051.
CO2	Develop the program for 8051 for the given operations.
CO3	Interpret the program by using timer, interrupt and serial port/parallel port.
CO4	Interface various input and output devices to microcontroller.
CO5	Comprehend the concept of embedded systems, aurdino and its programming.

Course Content Details:

Unit No	Topics / Sub-topics
1	Basics of Microcontroller 8051: General architecture of Microcontroller Comparison of Microprocessor and Microcontroller Architecture of 8051 Pin configuration and signal description of 8051 Memory Organization of 8051 Special features of 8051- Boolean Processor, Power saving options- idle and power

	down mode, Derivatives of 8051(8951, 8952, 8031, 8751). Course Outcome: CO1 Teaching Hours :8hrs Marks: 10 (R- 4, U-6, A-0)
2	8051 Instruction set and Programming Instruction set (Data transfer, Arithmetic and Logical, Branching, Machine control, stack operation, Boolean) Addressing modes Assembly language programming 8051 programming in C Course Outcome: CO2 Teaching Hours :10hrs Marks: 14 (R- 0, U-0, A-14)
3	Timer, Interrupts, Serial and Parallel communication 8051 Timer/Counter: Logic and Modes. Programming of 8051 timer 8051 Interrupts: Interrupts and polling, SFRs- IE, IP, Priority level and interrupt sequence Serial Communication: SCON, SBUF, Modes of serial communication, Programs on serial communication Parallel communication: I/O port structure and its programming Course Outcome: CO3 Teaching Hours :8hrs Marks: 8 (R- 0, U-4, A-4)
4	Memory and I/O Interfacing Memory Interfacing: Interfacing of external program and data memory, Address map table I/O Interfacing: Interfacing of LEDs, Relays, Keyboard, Seven segment display, LCD, Stepper motor, DC motor, ADC 0808, DAC 0808 Applications of 8051 Square wave generation using port pins of 8051 Triangular wave generation using DAC Water level controller Temperature controller using ADC Stepper motor control for clockwise and anticlockwise rotation. Traffic light controller Programming can be in assembly language or C (student's choice) Course Outcome: CO4 Teaching Hours :10hrs Marks: 14 (R- 0, U-0, A-14)

5	<p>Introduction to embedded systems</p> <p>Block diagram of embedded system with hardware components.</p> <p>Harvard and Von Neumann architecture, RISC and CISC processors</p> <p>Characteristics of embedded system. Processor power, memory. operating system. reliability, performance, power consumption, unit cost size, flexibility.</p> <p>Classification of embedded system</p> <p>Course Outcome: CO5 Teaching Hours :4hrs Marks: 4 (R- 2, U-2, A-0)</p>
6	<p>Open source embedded development board (Arduino)</p> <p>Arduino Birth, Open source community</p> <p>Functional block diagram of Arduino</p> <p>Functions of each pin of Arduino</p> <p>I/O functions, Looping techniques, Decision-making techniques.</p> <p>Programming of an Arduino</p> <p style="padding-left: 40px;">Interfacing LEDs, Seven segment display, LCD, ADC, DAC, Stepper motor, DC Motor.</p> <p style="padding-left: 40px;">Various applications using Arduino.</p> <p>Course Outcome: CO5 Teaching Hours :5hrs Marks: 10 (R- 0, U-4, A-6)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basics of Microcontroller 8051	4	6	0	10
2	8051 Instruction set and programming	0	0	14	14
3	Timer, Interrupts, Serial and Parallel communication	0	4	4	08
4	Memory and I/O interfacing	0	0	14	14
5	Introduction to Embedded systems	2	2	0	04
6	Open source embedded development board (arduino)	0	4	6	10
Total		06	16	38	60

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Identify various blocks of 8051 microcontroller development board	02
2	2	CO2	Write an assembly language program to perform arithmetic operations such as addition, subtraction, multiplication and division	02
3	2	CO2	Write an ALP to find smallest/largest numbers from the given data bytes stored in internal/external data memory locations	02
4	2	CO2	Write an ALP to arrange numbers in ascending/descending order. Write a C program for the same task.	02
5	3,4	CO3 CO4	Interface LED with microcontroller and turn it ON for 1 sec. Write program either in C or assembly language.	02
6	3	CO3	Develop an ALP to generate pulse and square wave by using timer delay.	02
7	4	CO4	Interface 7 segment display to 8051 and display numbers 0 to 9 on it.	02
8	4	CO4	Interface 4X4 keyboard matrix with 8051 and display the key pressed on 7 segment display	02
9	4	CO4	Interface stepper motor to 8051 and write a program to rotate in clockwise and anticlockwise direction for given angles.	02
10	6	CO5CO6	Control the speed of DC motor using Arduino.	02
11	6	CO5CO6	Implement line follower robot using Arduino.	02
12	6	CO5CO6	Implement water level controller using Arduino	02
13	6	CO5CO6	Implement Digital Thermometer using Arduino	02
14	6	CO5CO6	Interface 4x4 keyboard matrix and 16x2 LCD to Arduino	02
15	6	CO4CO5	Interface DAC to 8051 and write ALP to generate square and triangular waveforms.	02

Note: Experiments No. 1, 3, 6, 11, 12 and 15 are compulsory. Remaining 4 experiments should be performed as per the importance of the topic.

References/ Books:

Sr. No.	Book Title	Author, Publisher, Edition and Year Of publication	ISBN
1	The 8051 Microcontroller and Embedded Systems: Using Assembly and C	Mazidi, Pearson Education India; 2 edition 2007	978-8131710265
2	The 8051 Microcontroller & Embedded Systems Using Assembly and C with CD	Kenneth Ayala, Delmar Cengage Learning; First edition . January 2010	978-8131511053
3	Introduction to Embedded System	Shibu K. V., MC Graw Hill, First edition, 2009	978-1259081514
4	Beginning Arduino	Michael McRoberts, Technology in action, First edition 2010	978-1430232414
5	Programming Arduino Getting started with sketches	Simon monk, MC Graw Hill, First edition, 2012	978-0071784238

E-References:

1. www.tutorialspoint.com/microprocessor/microcontrollers_8051_architecture.htm
2. www.elprocus.com/8051-microcontroller-architecture-and-applications/
3. www.javatpoint.com/embedded-system-8051-microcontroller-architecture
4. <http://index-of.es/Varios-2/Programming%20Arduino.pdf>
5. <http://www.digimat.in/nptel/courses/video/108105102/L31.html>
6. <https://www.arduino.cc/en/Tutorial/BuiltInExamples>

CO Vs PO and CO Vs PSO Mapping (Information Technology)


CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3							1		
CO2	3	2	3	3	3			3		
CO3	3	3	3	3	3		3			1
CO4	3	2	3	3	3		3	3	1	2
CO5	3	3	3	3	3	3	3	3	1	2


CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

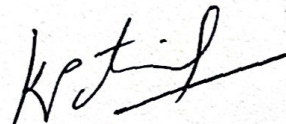
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3							2	2	
CO2	3	2	3	3	3			2	3	
CO3	3	3	3	3	3		3	2	2	1
CO4	3	2	3	3	3		3	1	3	2
CO5	3	3	3	3	3	3	3	2	2	1


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5	Dr. R. A. Patil (Curriculum Content Designer)	Lecturer in Electronics	Govt. Polytechnic Mumbai

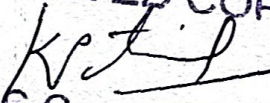
Coordinator: 
Curriculum Development,
Department of Information Technology


Head of Department
Department of Information Technology


I/C, Curriculum Development Cell


Principal

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CDC Co-ordinator
G. P. Mumbai

Programme: Diploma in Information Technology (Sandwich Pattern)										
Course Code: IT19R307				Course Title: Agile And DevOps						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	02	-	05	60	20	20	25*	-	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR26.

Rationale:

Agile DevOps is a combination of agile principles and practices, and DevOps culture and technical practices. Agile DevOps aims to build, test and release software faster and more reliably by increasing automation and collaboration between development and operation teams. Agile DevOps uses iterative software development methods such as Scrum, to complete work in short increments, called sprints.

We have an industry where most organizations only adopt DevOps because of the "hype" and are incapable of taking the most out of it. For this to be possible, you need both sides, business, and technical people, to speak the same language.

This course empowers software engineers to understand the link between DevOps and business goals, making them capable of negotiating resources for DevOps initiatives more effectively. Further, it educates managers about the fundamentals of DevOps, empowering them on how to make the most of DevOps for their organization.

Course Outcomes:

Student should be able to

CO1	Contrast the waterfall and agile software development lifecycle models.
CO2	Understand the fundamentals of DevOps.
CO3	Analyze how big tech companies such as Netflix and Spotify applied DevOps and revolutionized business models, product management, and quality management.
CO4	Understand how DevOps enables Agile and Lean.
CO5	Create versions with Git and GitHub.
CO6	Understand the Agile Scrum Framework.

Course Content Details:

Unit No	Topics / Subtopics
1	<p>Agile Software Development:</p> <p>1.1 Simple vs Complex Problems 1.2 Dealing with Uncertainty 1.3 Software Life Cycle 1.4 Software Processes 1.5 Waterfall Overview 1.6 Agile Software Development and Lean Thinking</p> <p>Course Outcome: CO1 Teaching Hours: 4 hrs</p>
2	<p>DevOps Fundamentals:</p> <p>2.1 The Need for Speed 2.2 The 3 Existing Paradigms to Develop Software 2.3 Deployment Process Flow 2.4 Introduction to DevOps 2.5 Continuous Integration x Continuous Delivery x Continuous Deployment 2.6 Data-Driven Software Development 2.7 DevOps Culture 2.8 Site Reliability Engineering</p> <p>Course Outcome: CO2 Teaching Hours: 5 hrs</p>
3	<p>DevOps at Big Tech Companies:</p> <p>3.1 DevOps at Spotify: Overview, Release Trains & Feature Toggle. Managing Risk, DevOps and Microservices 3.2 DevOps at Meta: Overview, The Facebook Chat Story, The Facebook Fax A Photo Story, DevOps and Quality Assurance 3.3 DevOps at AutoDesk: Overview, Pipeline for Documents, DevOps and SoftwareEngineers 3.4 DevOps at Netflix: Overview, Chaos Engineering, A/B Testing, DevOps and ProductManagement</p> <p>Course Outcome: CO3 Teaching Hours: 5 hrs</p>
4	<p>DevOps with Agile:</p> <p>4.1 What Problems Trigger DevOps? 4.2 What are DevOps Benefits? 4.3 DevOps and the Agile Mindset 4.4 Words of Caution 4.5 SOTA, DevOps, BizDevOps, DevSecOps, DataOps, MLOps, ModelOps 4.6 IaaS vs PaaS vs SaaS</p> <p>Course Outcome: CO4 Teaching Hours: 5 hrs</p>

5	<p>Versioning using Git & GitHub: 5.1 Introduction 5.2 Versioning with Git and GitHub: Version, Version Control, Git and its Distributed Version Control System 5.3 Setting up Your Environment: Installing and Configuring Git, GitHub Overview, Creating an Account 5.4 Git Fundamentals: Git Lifecycle, Showing Hidden Files, Creating a Local Git Repository in Your Machine, Versioning Lifecycle in Practice using Git Locally, Viewing the History of your Git Repository, Restoring Previous Versions of a Project 5.5 GitHub Fundamentals: Versioning Lifecycle in Practice using GitHub, Cloning Repositories in GitHub, A Graphical User Interface for Git, GitHub Desktop Course Outcome: CO5 Teaching Hours: 6 hrs</p>
6	<p>Agile Scrum: 6.1 Introduction: Scrum Overview, Scrum as a Framework, The Scrum Guide 6.2 The Scrum Team: Introduction to the Scrum Team, Product Owner, The Developers, Scrum Master 6.3 Scrum Flow: A Quick Look at our Case Study (Project Simulation), Case Study Description, The Product Goal, The Product Goal in practice, The Product Backlog, The Increment, Definition of Done, Sprint Planning & Sprint Backlog, Developing the Product, The Daily Scrum, Sprint Review, Gathering Users Feedback, Sprint Retrospective, Conduct a Sprint Retrospective Course Outcome: CO6 Teaching Hours: 5 hrs</p>

List of experiments: Total 10 experiments (or turns) out of 13 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Identify Simple Problems and Complex Problems.	2
2	1	CO1	Analyze given problem and identify Uncertainty.	2
3	1	CO1	Case study based on Agile Software Development and Lean Thinking.	6
4	2	CO2	Case study based on Data-Driven Software Development.	6
5	3	CO3	Case study based on DevOps at Spotify.	6
6	3	CO3	Case study based on DevOps at Meta.	6
7	3	CO3	Case study based on DevOps at AutoDesk.	6
8	3	CO3	Case study based on DevOps at Netflix.	6
9	4	CO4	SOTA, DevOps, BizDevOps, DevSecOps, DataOps, MI.Ops, ModelOps.	2

10	5	CO5	Perform following with Git: a) Install and Configure Git. b) Showing Hidden Files. c) Create a Local Git Repository in Your Machine. d) Versioning Lifecycle in Practice using Git Locally. e) View the History of your Git Repository. f) Restore Previous Versions of a Project.	6
11	5	CO5	Perform following with GitHub: a) Create an Account. b) Versioning Lifecycle in Practice using GitHub c) Clone Repositories in GitHub d) A Graphical User Interface for Git: GitHub Desktop	6
12	6	CO6	Case study based on Agile Scrum Framework.	6
Total				60

References/ Books:

Sr. No.	Title	Author	Publication
1	The DevOps Handbook	Gene Kim, Jez Humble, Patrick Debois, John Willis	IT Revolution. 2016
2	Leading the Transformation Applying Agile and DevOps Principles at Scale	Gary Gruver, Tommy Mouser	IT Revolution Press
3	Agile Project Management with Azure DevOps	Joachim Rossberg	Apress
4	DevOps for the Modern Enterprise	Mirco Hering	IT Revolution Press

E-References:


1. <https://scaledagileframework.com/devops/>
2. <https://agilefirst.io/agile-devops/>
3. <https://www.udemy.com/course/devops-culture-and-agile-software-development-the-complete-guide/>
4. <https://www.theknowledgeacademy.com/in/courses/devops/certified-agile-devops-professional-cadop-/#faqCourse>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	2	1	1	1
CO2	2	2	2	2	2	2	2	1	1	1
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	2	3	2	2	2	1	2	2	2
CO5	2	2	2	3	2	2	2	2	2	1
CO6	2	1	2	2	2	1	2	1	2	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms.Dipali Gosavi	Lecturer Information Technology Department	Government Polytechnic. Mumbai
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3	Sayyed Shabana Usman	Visiting Lecturer. Information Technology Department	Government Polytechnic. Mumbai



Coordinator,

Curriculum Development,

Department of IT


Head of Department

Department of _____

I/C. Curriculum Development Cell

Principal

Programme : Diploma in Information Technology (Sandwich Pattern)										
Course Code: IT19R401				Course Title: Python Programming						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2		5	60	20	20	25*	--	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid-term and second skill test at the end of the term

Rationale:

Python is powerful programming language. It has efficient high level data structure and a simple but effective approach to object oriented programming. Python code is simple, short, readable, intuitive and powerful and thus it is effective for introducing computing and problem solving to beginners. It's elegant syntax and dynamic typing together with its interpreted nature make it ideal language for scripting and rapid application development in many areas and most platforms.

Course Outcomes: Student should be able to

CO1	Perform different operation on data structures in python with decision making and functions
CO2	Apply object oriented concept in python programming.
CO3	Perform file handling with exceptions.
CO4	Validate the fields using regular expression
CO5	Design GUI forms and Database connectivity

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction to Python Features of python Python building blocks: Identifiers, Keywords, Indentation, Variables, Comments Python Environment setup: Installation and working on IDE. Python Data Types: Number, String, Tuple, Array, List, Dictionary Declaration and use

	<p>of data types.</p> <p>1.5 Basic Operations: Arithmetic ,Comparison/Relational ,Logical ,Assignment , Bitwise ,Membership ,Identity Operator</p> <p>Course Outcome: CO1 Teaching Hours: 05 Hrs Marks: 10(R-02, U-02, A-0)</p>
2	<p>Decision Making and Functions</p> <p>decision making statements(ifelif...else , Nested if)</p> <p>looping statement(for ,while)</p> <p>Loop Manipulation using continue, break, pass statements</p> <p>Functions</p> <p>Use Of Python Built –in -Functions: type/data conversion functions, Maths Functions</p> <p>Course Outcome:CO1 Teaching Hours :10Hrs Marks: 10 (R-02, U-04, A-04)</p>
3	<p>Object Oriented Programming in Python</p> <p>3 .1 Creating a Class</p> <p>Self Variables</p> <p>Types of Methods</p> <p>Constructors</p> <p>Inheritance</p> <p>Polymorphism</p> <p>Operator Overloading</p> <p>Method Overloading & Overriding</p> <p>3.5 Exception Handling</p> <p>Errors in a Python Program</p> <p>Exceptions</p> <p>Types of Exceptions</p> <p>The Except Block</p> <p>3.6 Introduction to Multithreading.</p> <p>Course Outcome: CO2 Teaching Hours : 10Hrs Marks: 10 (R-04, U-04, A-02)</p>
4	<p>File Handling</p> <p>Types of Files in Python</p> <p>Opening a File</p> <p>Closing a File</p>

	<p>Knowing Whether a File Exists or Not</p> <p>Working with Binary Files</p> <p>Appending Text to a File</p> <p>Understanding read functions, read(), readline() and readlines()</p> <p>Understanding write functions, write() and writelines()</p> <p>Manipulating file pointer using seek</p> <p>File Exceptions</p>		
	<p>Course Outcome:CO3</p>	<p>Teaching Hours : 05Hrs</p>	<p>Marks: 8 (R-02, U-04, A-02)</p>
5	<p>Python Regular Expressions</p> <p>Powerful pattern matching and searching</p> <p>Power of pattern searching using regex in python</p> <p>5.3 Password, email, url validation using regular expression</p>		
	<p>Course Outcome: CO4</p>	<p>Teaching Hours :05Hrs</p>	<p>Marks: 10(R-02, U-04, A-04)</p>
6	<p>GUI Programming and Databases</p> <p>GUI Programming:</p> <p>Writing a GUI with Python</p> <p>GUI Programming Toolkits</p> <p>Creating GUI Widgets with Tkinter</p> <p>Creating GUI using Turtle</p> <p>Creating Layouts, Radio Buttons and Checkboxes, Dialog Boxes.</p> <p>Database Access:</p> <p>Python's Database Connectivity</p> <p>Types of Databases Used with Python</p> <p>Mysql database Connectivity with Python</p> <p>Performing Insert, Deleting & Update operations on database</p>		
	<p>Course Outcome: CO5</p>	<p>Teaching Hours :10Hrs</p>	<p>Marks:12(R-02, U-04, A-06)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Python	2	2	6	10
2	Decision Making and Functions	2	4	4	10
3	Object Oriented Programming in Python	4	4	2	10
4	File Handling	2	4	2	08
5	Python Regular Expressions	2	4	4	10
6	GUI Programming and Databases	2	4	6	12
Total		14	22	24	60

List of experiments :Total 12 experiments (or turns) out of 20 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Write python programs to understand Expressions, Variables, Basic Math operations, Strings: Basic String Operations & String Methods. (Minimum four Programs based on math operations, Strings)	2
2	2	CO2	Develop programs to understand the control structures of python (minimum 4 programs on decision making and looping) 1. Armstrong Number 2. factorial number 3. Array calculations 4. even odd number OR any other suggested by teacher	2
3	3	CO2	Write python programs to understand classes and objects. (minimum 2 programs to create classes and objects)	2
4	4	CO3	Write python programs to understand different File handling operations 1. Create a file 2. Copy contents from one file to another file.	2
5	5	CO4	Develop programs to validate the fields using regular expressions in python.	2
6	6	CO5	1. Develop programs to learn GUI programming using Tkinter 2. Develop a program to draw different shapes on Canvas using Tkinter	2
7	1	CO1	Develop programs to learn different types of structures and operations on (list, dictionary, tuples, arrays) in python.	2

			1.add 2.delete 3.merge 4.sort 5.membership operator	
8	2	CO1	Develop a python programs for function 1.Returning result from a function 2.Returning multiple values from a function (minimum 4 similar programs for practice)	2
9	2	CO1	Develop a program for Functions are First class objects 1.Assign function to a variable 2.to define one function inside another function 3. to pass a function as parameter to another function 4. a function can return another function	2
10	2	CO1	Develop a program for 1.pass by value or call by value 2. pass by reference or call by reference 3. Types of arguments 4.lambda Functions	2
11	3	CO2	Write a python program to implement multiple inheritances.	2
12	5	CO4	Develop a program for validating the fields in file using regular expression	2
13	6	CO5	Draw graphics using Turtle.	2
14	6	CO5	Develop a program to add different Widgets on Frame 1.Button 2.Label 3.Message/text 4.Scrollbar 5.Checkbutton	2
15	6	CO5	Write python programs to understand database connectivity	2
Total				30

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Core Python Programming	Dr.R.Nageswara Rao 2017 Edition Dreamtech Press.	978-93-5119-942-7
2	Python: The Complete Reference	Martin C.Brown, McGraw Hill Publication	9780072127188
3	Learning Python	Mark Lutz, David Ascher, O'Reilly Publication	ISBN-13 :978-0-596-00281-7

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2				2	2	3		1
CO2	1			1		2	2	3	1	2
CO3	1		1				2	3		
CO4	1	3	3	1		3	3	3	2	2
CO5	1	2	2	1		3	3	3	2	3

Industry Consultation Committee:

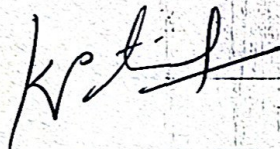
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3	Mrs Dipali Gosavi (Curriculum Content Designer)	Lecturer	Govt. Polytechnic Mumbai



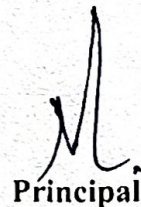
Coordinator,
Curriculum Development,
Department of Information Technology



Head of Department
Department of Information Technology

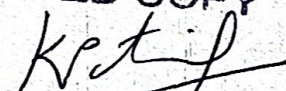


I/C, Curriculum Development Cell



Principal

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CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Computer Engineering and Information Technology (Sandwich Pattern)										
Course Code: CO19R403				Course Title: Next Generation Databases						
Compulsory / Optional: Compulsory for Computer Engineering Optional for Information Technology										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	-	5	60	20	20	25*	-	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode. @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

A key component of information systems is its database management system. This course encompasses the study of advance technologies in database. It introduces a non-relational database solution to work with semi-structured or unstructured data. This course helps students enhance their skills & competencies to implement database systems using advanced technologies.

Course Outcomes: Student should be able to

CO1	Understand the concept of non-relational database system.
CO2	Execute different MongoDB operations on database.
CO3	Execute different methods and advanced MongoDB operations on collection.
CO4	Configure MongoDB cluster on Cloud.
CO5	Understand the concept of Distributed database Systems.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Non-relational database system</p> <p>Relational (RDBMS) Vs. Non-relational database system (NoSQL).</p> <ul style="list-style-type: none"> Structured vs. unstructured data. <p>Introduction to NoSQL.</p> <p>1.2.1 Types of NoSQL.</p> <ul style="list-style-type: none"> Key-value database. Column Oriented database. Graph Oriented database. Document Oriented database. <p>CAP theorem.</p> <p>BASE properties.</p> <p>Benefits of NoSQL</p> <p>Applications of Non-Relational databases.</p>

	<p>Course Outcome: CO1 Teaching Hours :06 Marks:10 (R-06, U-04,A-)</p>
2	<p>Introduction to MongoDB MongoDB overview.</p> <ul style="list-style-type: none"> • Mongo Shell • Features of MongoDB. • RDBMS concepts mapping to MongoDB. • BSON and JSON document formats. <p>MongoDB Data types</p> <p>Basic operations in MongoDB</p> <ul style="list-style-type: none"> • Create and Drop Database. • Create and Drop Collection. <p>MongoDB CRUD Operations</p> <ul style="list-style-type: none"> • Create • Read • Update • Delete <p>MongoDB Data Modeling and data relationships</p> <ul style="list-style-type: none"> • Embedded document. • Reference document. • Querying Embedded documents. <p>Arrays</p> <ul style="list-style-type: none"> • Querying Array elements.
	<p>Course Outcome: CO2 Teaching Hours :13 Marks:16 (R-04, U-04,A-08)</p>
3	<p>Advanced MongoDB Methods in MongoDB</p> <ul style="list-style-type: none"> • Projection • Skip • Limit • Sort • Save • Gridfs <p>Indexing</p> <ul style="list-style-type: none"> • Types of Index • Covered queries <p>Aggregation Framework</p> <ul style="list-style-type: none"> • Pipeline operations • MapReduce <p>CAPPED Collection</p> <p>Replication- Replica Set Configuration, Components of Replica Set</p>

	Sharding Database backup and Restore			
	Course Outcome: CO3	Teaching Hours :12	Marks:16 (R-04, U-04,A-08)	
4	Hosting MongoDB on Cloud Introduction to Cloud database. Benefits of Cloud database/DBaaS MongoDB Atlas <ul style="list-style-type: none"> • Deployment of Free Cluster using MongoDB Atlas. • Cluster Configuration. • Connect Cluster to Mongo Shell. • Access and modify database on Cloud through Mongo Shell. 			
	Course Outcome: CO4	Teaching Hours :05	Marks:08 (R-04, U-04,A-)	
5	Distributed databases Introduction <ul style="list-style-type: none"> • Distributed database system vs. Centralized database system. Features Classification <ul style="list-style-type: none"> • Homogeneous DDBMS • Heterogeneous DDBMS Architectural models of DDBMS <ul style="list-style-type: none"> • Client –Server architecture • Peer to Peer architecture • Multi DBMS (MDBS) architecture Distributed data storage techniques Fragmentation: Horizontal, Vertical, Hybrid Replication 5.6 Applications of Distributed databases.			
	Course Outcome: CO5	Teaching Hours :09	Marks:10 (R-02,U-04,A-04)	

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Non-Relational Database System	06	04	-	10
2	Introduction to MongoDB	04	04	08	16
3	Advanced MongoDB	04	04	08	16
4	Hosting MongoDB on Cloud	04	04	-	08
5	Distributed Databases	02	04	04	10
Total		20	20	20	60

List of experiments: Total 10-12 experiments (or turns) out of 15-16 experiments (or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	Installation of MongoDB.	02
2	2	CO2	Create Database and Collections in MongoDB. Perform CRUD-Create, Read, Update and Delete operations on created collections.	04
3	3	CO3	Implementation of different MongoDB methods on document: Projection, Skip, Limit, Sort and Save.	04
4	4	CO4	Host MongoDB on Cloud: <ul style="list-style-type: none"> • Create MongoDB Atlas account. • Create a new Cluster. • Configure Cluster. • Create Database users. • Connect created cluster with Mongo Shell 	04
5	5	CO5	Perform fragmentation operation on database.	02
6	2	CO2	Create a Collection containing embedded documents and arrays. Perform CRUD operations on created Collection.	02
7	3	CO3	Store any mp3 file using Gridfs method.	02
8	3	CO3	Execute aggregate functions on collection. Implement pipeline operations on collection.	04
9	3	CO3	Create different types of Index on Collection: Simple/Single index, Compound index, Multikey index. Execute Covered queries on Collection.	02
10	3	CO3	Execute commands to create database backup and to restore data.	02
11	3	CO3	Perform Replication operation on database.	02
Total				30

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	MongoDB- The Definitive Guide	Kristina Chodorow, O'Reilly, May 2013	ISBN: 978-1-449-34468-9
2	Data Modeling for MongoDB	Steve Hoberman, Technics Publications	9781634620413
3	Principals of Distributed Database Systems.	M. Tamer Ozsu; Patrick Valduriez, Springer	

E-References:

1. www.MongoDB.com2. www.w3resource.com3. <https://docs.oracle.com>

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	2	2	1	3
CO2	2	2	3	3	1	1	2	3	3	2
CO3	1	2	3	3	1	1	2	3	3	3
CO4	1	2	3	3	1	1	2	3	3	3
CO5	1	2	3	3	1	1	2	3	2	3

CO Vs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	2	2	1	3
CO2	2	2	3	3	1	1	2	3	3	2
CO3	1	2	3	3	1	1	2	3	3	3
CO4	1	2	3	3	1	1	2	3	3	3
CO5	1	2	3	3	1	1	2	3	2	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
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Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

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CDC Co-ordinator
G. P. Mumbai

Programme: Diploma in Computer Engineering and Information Technology (Sandwich Pattern)										
Course Code: CO19R305				Course Title: Computer Networks						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	--	5	60	20	20	--	50*	--	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale: In today's age of Technology many applications send information from one place to another place. Computer network organizes this information in such a way that it can be sent anywhere over wide geographical area and output remote information at a push of button. This indicates the type of networks used. Here we study basic concept of networking, its applications, topologies, network devices, protocol used, OSI reference model, TCP/IP model, IP addressing and various types of the communication protocols.

Course Outcomes: Student should be able to

CO1	Classify types of Computer Networks.
CO2	Classify different transmission medias and switching techniques.
CO3	Identify network devices and describe their functions.
CO4	Compare and explain OSI reference and TCP/IP models
CO5	Explain functions of various protocols in TCP/IP model.
CO6	Configure Wired and Wireless LAN.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Basics of Computer Network</p> <p>Introduction to Computer Network: Definition of Computer network, sharing information, sharing resources, file sharing.</p> <p>Categories of Network: Based on scope - LAN, MAN, WAN .Based on Connection - Peer to Peer network, Client- Server Network, Centralized network, Distributed network.</p> <p>Network Architecture:-Features and Applications</p> <p>Applications and Benefits of Computer Network.</p> <p>Course Outcome: CO1 Teaching Hours :06-hrs Marks:08(R- 2, U-4, A-2)</p>
2	<p>Transmission Media and Switching</p> <p>2.1 Communication Media : Guided Transmission Media : Twisted pair cable, Coaxial cable, Fibre optic cable. 2.2 Unguided Transmission Media : Radio waves, Microwaves, Infrared, Satellite.</p> <p>Line-of-Sight Transmission : Point to point, Broadcast.</p> <p>Multiplexing: Frequency Division Multiplexing, Time division Multiplexing.</p>

	2.5 Switching : Circuit Switched networks, Packet Switched Networks. Course Outcome:CO2Teaching Hours :04 hrs Marks: 08(R- 2 , U- 4 ,A-2)
3	Network Topologies and Devices Network Topologies : Introduction, Definition,Selection Criteria,Types of Topologies – Bus, Ring, Star, Mesh, Tree, Hybrid. Network Connecting Devices: NIC (Network Interface Card), Hub, Switch, Router, Repeater, Bridge, Gateway, Modem, Wireless infrastructure Components. Course Outcome:CO3Teaching Hours : 04 hrsMarks: 06 (R- 2 , U- 4)
4	Network Reference Models OSI Reference Model : Layered Architecture ,Peer-to-Peer Processes,Interfaces between layers,Protocols,Organization of layers,Functions and features of each layer. TCP/IP Model : Layered Architecture,Organization of layers,Functions and features of each layer. Comparison between OSI Model and TCP/IP Model. Course Outcome:CO4Teaching Hours :12 Marks: 14 (R-4 , U- 6 , A-4)
5	TCP/IP Protocols Network Access/Link layer protocols :Ethernet, Token Ring,, Network access to Internet layer Mapping: ARP and RARP protocol Internet Layer: IP Protocol, IP Address, Classful and Classless Addressing, IPV4 and IPV6 protocol.DHCP Protocol,Network Address Translation(NAT) protocol, ICMP protocol. Transport Layer : Connection Oriented and Connection less service, TCP and UDP protocol. Application Layer Protocols : HTTP,HTTPS,SMTP ,SNMP,TELNET,DNS and FTP protocol. Course Outcome:CO5Teaching Hours :12 Marks: 14 (R- 4 , U- 6 , A- 4)
6	Wired and Wireless LAN Wired LAN : Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, Ethernet IEEE standard 802.3, Bridged Ethernet, Switched Ethernet , Full Duplex Ethernet. Multiple Access Random Access : ALOHA, CSMA, CSMA/CD, CSMA/CA Wireless LANs : wireless communication system, Bluetooth Architecture, Bluetooth layers connecting LANs , Wi-Fi Architecture , Wi-Fi connecting LAN, Introduction to Li-Fi. Course Outcome:CO6Teaching Hours :07 Marks: 10 (R- 2 , U- 4 , A- 4)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basics of Computer Network	2	4	2	8
2	Transmission Media and Switching	2	4	2	8
3	Network Topologies and Devices	2	4	--	6
4	Network Reference Models	4	6	4	14
5	TCP/IP Protocols	4	6	4	14
6	Wired and Wireless LAN	2	4	4	10
Total		16	28	16	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,3	CO1,CO3	Identify components of Network and study Local Area Network in your Lab.	2
2	2	CO2	Draw network layout and type of topology used for computer lab networking.	2
3	2	CO2	Create network cable by crimping the straight and cross CAT 5 cables and test it using CableTester	2
4	3	CO3	Install Network Interface card and locate MAC address of computer.	2
5	6	CO6	Connect computers in Network using given topology with wired media	2
6	6	CO6	Connect computers using Wireless Media	2
7	3	CO1,CO3	Sharing files , folders and Printer in a Network.	2
9	3	CO1,CO3	Connect your system to the Internet.	2
10	5	CO5	Configure Static and dynamic IP addresses	2
11	6	CO6	Install and Configure Wireless LAN using Wi-fi and configure hotspot.	2
12	5	CO5	Execute basic Networking commands : Ping,ipconfig,tracert,netstat,route.	2
13	5	CO5	Install Wireshark and configure as Packet Sniffer.	2
14	1,3,5	CO1,CO3, CO5	Identify and troubleshoot the problem in any non functioning LAN.	2
15	All	All	Arrange Industrial visit to observe Networking and Resource sharing.	---
16	All	All	Mini Project to be completed by group of 3 or 4 students	4
Total				30

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Data Communication and Networking	Behrouz, Forouzan TMH 1999	ISBN-13: 978-0073376226
2	Computer Networks	Tanenbaum Fourth edition	ISBN 13: 9780132126953
3	Computer Networking: A Top-Down Approach (6th Edition)	Kurose and Ross	ISBN-13: 978-8131790540
4	Data Communication and Networking	Godbole Achyut	ISBN-13: 978-0071077705

E-References:

1. <https://ndl.iitkgp.ac.in/>
2. www.tutorialspoint.com
3. www.nptel.com 4. www.udemy.com
5. www.netacad.com

CO VsPO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	1	2	3	2	2
CO2	3	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	2	2	2	3	2	2
CO4	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	2	2	2	3	3	3
CO6	2	3	3	2	2	2	2	3	2	3

CO VsPO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	1	2	2	1	1
CO2	3	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	2	2	2	3	2	2
CO4	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	2	2	2	3	3	3
CO6	2	3	3	2	2	2	2	3	2	3

Industry Consultation Committee:

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Coordinator, *Ranakar*
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Department of Computer Engineering

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Head of Department
Department of Computer Engineering

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I/C, Curriculum Development Cell

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CDC Co-ordinator
G. P. Mumbai

Programme: Diploma in Computer Engineering and Information Technology (Sandwich Pattern)										
Course Code: CO19R209				Course Title: Software Engineering						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs) 30 Mins	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	--	--	03	60	20	20	--	--	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Software Engineering is an engineering discipline that is concerned with all aspects of software production. Further it is the systematic application of scientific and technological knowledge, methods, and experience to the design, implementation, testing, and documentation of software. This +course intends to develop a systematic, disciplined approach to the development, operation, and maintenance of software and help students to get acquainted with latest trends in Software Engineering.

Course Outcomes: Student should be able to

CO1	Understand the basics of Software Engineering.
CO2	Identify suitable process model for software development.
CO3	Understand importance of Agile Methodology.
CO4	Apply Software Engineering principles at various stages of Software Development.
CO5	Use software modelling to create data designs.
CO6	Apply project management principles for software development.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Overview of Software Engineering</p> <p>Definition of Software Software Characteristics, Software Applications, Software myths Types of Software Software Engineering- Definition, Need Software Engineering- A Layered Approach Software Development Generic Process Framework- Typical Umbrella Activities, Identifying A Task Set. Some Terminologies</p> <ul style="list-style-type: none"> ● Product and Process ● Module and Software Components ● Deliverables and Milestones <p>Course Outcome: CO1 Teaching Hours :07 Marks: 10 (R- 6, U-2, A-2)</p>
2	<p>Process Models</p> <p>Personal and Team Process Models (PSP and TSP) Waterfall Model V Model Incremental Process Model Evolutionary Process Model: Prototyping Selection criteria for software process model.</p> <p>Course Outcome:CO2 Teaching Hours :06 Marks: 08 (R-2 , U-4 , A-2)</p>
3	<p>Agile Methodology</p> <p>Agile Software Methodology:</p> <ul style="list-style-type: none"> ● What is Agile Methodology ● Importance of Agile Methodology ● Difference between Prescriptive and Agile Process Model ● Agility Principles <p>Adaptive Software Development Agile Process Model: Scrum Scrum Process Flow Dynamic Systems Development Method (DSDM) Introduction to DevOps JIRA</p> <p>Course Outcome:CO3 Teaching Hours : 08 Marks:10 (R- 2 , U- 4 , A-4)</p>
4	<p>Software Requirement Engineering</p> <p>Software Engineering Practices and its importance, Core principles. Communication Practices, Planning Practices, Modelling Practices , Construction Practices, Software Deployment(Statement and meaning of each principle) Requirement Engineering: Requirement Gathering and Analysis,</p>

	<p>Types of Requirements (Functional, Product, organizational, External Requirements), Eliciting Requirements, Developing Use cases, Building requirement models, Requirement Negotiation, Validation.</p> <p>4.4 Software Requirement Specification: Need of SRS, Format, and its Characteristics.</p> <p>Course Outcome: CO4 Teaching Hours :07 Marks:10 (R-2 , U-4 , A- 4)</p>
5	<p>Software Modelling and Design</p> <p>Translating Requirement Model into Design Model: Data Modelling.</p> <p>Analysis Modelling: Elements of Analysis model.</p> <p>Design Modelling: Fundamental Design Concept (Abstraction, Information hiding, Structure, Modularity, Concurrency, Verification, Aesthetics)</p> <p>Design Notations: Data Flow Diagram (DFD), Structured Flowcharts and Decision Tables</p> <p>Testing- Meaning and purpose, Testing methods-Black-box and White-box, Level of Testing-Unit Testing, Integration Testing ,User Acceptance Testing</p> <p>Test Documentation- Test Case Template, Test plan, Introduction to defect report, Test Summary Report</p> <p>Course Outcome: CO5 Teaching Hours : 10 Marks:12 (R-4 , U-4 , A- 4)</p>
6	<p>Software Project Management</p> <p>The management spectrum-4P's</p> <p>Metrics for Size Estimation: Line of Code (LoC), Function Points (FP).</p> <p>COCOMO (Constructive Cost Model)</p> <p>Risk Management: Risk Identification, Risk Assessment, RMMM Strategy.</p> <p>DevOps testing methods.</p> <p>Course Outcome: CO6 Teaching Hours ; 07 Marks:10 (R- 2 , U-4 , A -4)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Overview of Software Engineering	6	2	2	10
2	Process Models	2	4	2	08
3	Agile Methodology	2	4	4	10
4	Software Requirement Engineering	2	4	4	10
5	Software Modelling and Design	4	4	4	12
6	Software Project Management	2	4	4	10
Total		18	22	20	60

References/ Books:

Sr. No	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Software Engineering A Practitioner's Approach	Roger Pressman	9780078022128
2	Fundamentals of Software Engineering	Rajib Mall	9788120348981
3	Software Engineering Concepts	Richard Fairly	9780074631218
4	Software Engineering principles and practices	Deepak Jain	9780195694840

E-References:

1. www.sei.cmu.edu2. www.rspa.com/spi3. www.nptel.ac.in4. www.tutorialspoint.com/software_engineering

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

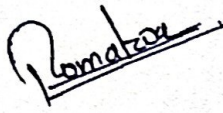
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	2	1	1	1
CO2	2	2	2	2	2	2	2	1	1	1
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	2	3	2	2	2	1	2	2	2
CO5	2	2	2	3	2	2	2	2	2	1
CO6	2	1	2	2	2	1	2	1	2	1

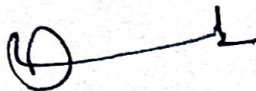
CO Vs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	2	1	1	1
CO2	2	2	2	2	2	2	2	1	1	1
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	2	3	2	2	2	1	2	2	2
CO5	2	2	2	3	2	2	2	2	2	1
CO6	2	1	2	2	2	1	2	1	2	1

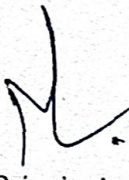
Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
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3	Pooja S Chame	Lecturer in Computer Engineering	Govt. Polytechnic Mumbai
4	Vinaya B. Savadekar	Lecturer in Computer Engineering	Govt. Polytechnic Mumbai


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Curriculum Development,
Department of Computer Engineering


Head of Department
Department of Computer Engineering


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G. P. Mumbai

Programme : Diploma in Information Technology (Sandwich Pattern)										
Course Code: IT19R305				Course Title: User Interface Design						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH	TS1	TS2	PR	OR	TW	Total
1	2		3	---	---	---	25*	--	25	50

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid-term and second skill test at the end of the term

Rationale:

This subject is the technology subject, Web Page Design and Visual Basic is essential for studying this subject. **UID** is based on dot.net technology, which is a framework, which supports many languages. **C#** is a multi-paradigm programming language encompassing strong typing, imperative, declarative, functional, generic object oriented, and component oriented programming language.

ADO.NET is a set of computer software components that programmers can use to access data and data services from the database **ASP.NET** is an open-source server-side web application framework designed for web development to produce dynamic web pages.

Course Outcomes: Student should be able to

CO1	Use GUI tools of .NET framework
CO2	Use basic and advance .NET controls.
CO3	Interface back-end and front-end.
CO4	Build applications integrated with .NET Framework.
CO5	Build applications using C#
CO6	Build ASP.NET based applications.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Introduction to C# and .Net framework. Review of .NET frameworks Introduction to C# Data Types Literals and Variables in C# Operators in C# Flow controls in C#</p> <p>Course Outcome:CO5 Teaching Hours :03Hrs Marks: NA</p>

2	Implementation of C# Classes and Objects Arrays and Strings Operator Overloading Inheritance Debugging and error handling in C# C# - Events, Properties, and Methods C# and the CLR C# and Generics Course Outcome:CO1,CO2 Teaching Hours :04Hrs Marks: NA
3	Introduction to ADO.Net and data manipulation Introduction to ADO.Net - What is database? - Writing XML file. - ADO.Net architecture. - Creating connection. - Dataset and Data reader. - Types of Data adapter and ADO controls. - Reading data into dataset and data adapter. Binding data to controls. - Data table and Data row. Accessing and manipulating data - Selecting data. - Insertion, deletion, updation, sorting. - How to fill dataset with multiple tables. Migrating from VB 6.0 to VB.Net - Updating the applications developed in VB to VB.Net Course Outcome: CO3 ,CO4 Teaching Hours : 04Hrs Marks: NA
4	Introduction and implementation of ASP.Net 4.1 Introduction to ASP.Net - Difference between ASP and ASP.Net - Introduction to IIS. - What is web application? Why it is used? 4.2 Implementation of ASP.Net - ASP.Net IDE. - Creation of web forms. - Using web form controls Course Outcome:CO6 Teaching Hours : 04 Hrs Marks: NA

Suggested Specifications Table (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to C# and .Net framework.	3	NA			
2	Implementation of C#	4				
3	Introduction to ADO.Net and data manipulation	4				
4	Introduction and implementation of ASP.Net	4				
Total		15				

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	CO	Title of the Experiments	Hours
1	1	5	Observe and draw visual .net IDE layout and hands on practice to create, save and open the project	2
2	1	5	Write, test and debug at least 5 loop, array and operator based C# programs.	4
3	1	5	Design forms and write, test and debug programs to test its various properties , methods, events.	2
4	2	1	Write, test and debug program to test input box and message box	2
5	2	1	Write, test and debug applications to use textbox, label, button	2
6	2	2	Write, test and debug applications to use radio button, checkbox, numeric updown and group box controls	2
7	2	2	Write, test and debug application using checked list box, scroll bars, timer control.	2
8	2	2	Write, test and debug applications using menu	2
9	3	3	Create and test connection using ado.net to view SQL express server/Microsoft Access data in textbox etc controls	4
10	3	3	Create connection view controls like data-grid view controls	2
11	3	3	Write, test and debug small application to add, edit, search, delete record in database in bounded mode	4
12	3	4	Write, test and debug small application to add, edit, search, delete record in database.	4
13	3	4	Write, test and debug small application to demonstrate data reports.	4
14	4	6	Write, test and debug small web application using asp.net	4
15	all	1,2,3 ,4,5, 6	Mini Project	2
Total				30

References/ Books:

Sr. No	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	The Complete Reference C#	Herbert Schildt Mc. Graw Hill	9780070703681
2	ASP.Net 4.0 Step By step	George Shepherd Microsoft	0735627010
3	The Complete Reference ADO.Net	Herbert Schildt Mc. Graw Hill	978-0072228984

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2					2	3		1
CO2	1			1			2	3	1	2
CO3	1		1				2	3		
CO4	1	3	3	2		3		3	2	2
CO5	2	2	2	1		3	3		2	3
CO6		3	1		1			1		1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Mahendra U. Dabhade	Lecturer	Government polytechnic Thane
2	Mr. Vaibhav A. Wankhade	Database Administrator	FIS Global Pune
3	Ms. Namrata A. Wankhade	Lecturer	Government polytechnic Mumbai

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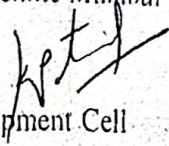
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