Government Polytechnic, Mumbai

Department of Computer Engineering

P23

Semester IV

(Course Contents)

Programme: Diploma in Computer Engineering

(Sandwich Pattern)

Government Polytechnic, Mumbai
(Academically Atonoums Institute, Government of Maharashtra)
Programme: Diploma in Computer Engineering (Sandwich Pattern)

Learning and Assessment Scheme **With Effect From Academic Year : 2023-24**
Duration Of Programme : 6 Semester **Scheme : P23**
Semester : Fourth **Duration : 16 WEEKS**

Sr No	Course Code	Course Title	Course Type	Total IKS Hrs for Sem	Learning Scheme					Credits	Assesment Scheme														
					Actual Contact Hrs/Week			Self Learning (TW + Assignment)	Notional Lerning Hrs / Week		Paper Duration (hrs.)	Theory					Based on LL & TL Practical					Based on Self Learning		Total Marks
												FA-TH	FA-TH	SA-TH	Total		FA-PR		SA-PR			SLA		
												T1	T2						Max					
					CL	TL	LL					Max	Max	Max	Max	Min	Max	Min	PR	OR	Min	Max	Min	
1	CO23109	Operating System	DSC	–	3	–	2	1	6	3	2.30	20	20	60	100	40	25	10	25#	–	10	25	10	175
2	CO23110	Software Engineering	DSC	–	3	–	2	1	6	3	2.30	20	20	60	100	40	25	10	–	–	–	25	10	150
3	CO23111	Advanced Java Programming	DSC	–	2	–	4	–	6	3	–	–	–	–	–	–	50	20	50#	–	20	–	–	100
4	CO23112	Next Generation Database	DSC	–	3	–	2	1	6	3	2.30	20	20	60	100	40	25	10	25#	–	10	25	10	175
5	CO23604	Mobile Application Development	SEC	–	2	–	4	–	6	3	–	–	–	–	–	–	50	20	50#	–	20	–	–	100
6	CO23201	Web Development using PHP	DSE	–	2	–	2	2	6	3	–	–	–	–	–	–	50	20	25#	–	10	25	10	100
	CO23202	Internet of Things																						
	CO23203	Artificial Intelligence																						
7	CO23401	Project Stage 1 (Seminar)	INP	–	–	–	2	2	4	2	–	–	–	–	–	–	50	20	25#	–	10	25	10	100
		Total		–	**15**	–	**18**	**7**	**40**	**20**					**300**		**275**		**200**			**125**		**900**

Abbreviations : CL-Classroom Learning, TL-Tutorial Learning, LL- Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning Assessment

Legends :@ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note : 1. FA-TH represents two class tests of 20 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then candidate shall be declared as fail & will have to repeat & resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*16 Weeks
5. 1 credit is equivalent to 30 Notional hrs. 6. *Self learning hours shall not be reflected in the TimeTable.

Course Category : Discipline Specific CourseCore(DSC): 5, Discipline Specific Elective (DSE):0,Value Education Course(VEC):1, Intern./Apprenti./Project./ Community(INP):0, Ability Enhancement Course (AEC) : 0, Skill Enhancement Course (SEC) : 1, Interdisciplinary Elective (IE) : 0

Department Coordinator, Curriculum Development, Dept. of Computer Engineering
Head of Department, Dept. of Computer Engineering
In-Charge, Curriculum Development Cell
Principal, Government Poly. Mumbai

Programme : Diploma in Computer Engineering and Information Technology (Sandwich pattern)													
Course Code:CO23109					**Course Title : Operating System**								
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH** (2Hrs.30 Min)	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
3	**--**	**2**	**1**	**6**	**3**	**20**	**20**	**60**	**25**	**25#**	**--**	**25**	**175**

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:

1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

I. 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.

II. Industry/Employer Expected Outcome

Engineers applying operating system concepts should proficiently solve real world problems and develop real life project.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning.

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.
CO5	Estimate efficiency of various memory management techniques
CO6	Illustrate File allocation and access methods

IV. Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Explain the function of Operating System. TLO 1.2- Explain characteristics of the given type of operating system. TLO 1.3 Identify type of OS suitable for given type of application.	**Operating System Overview** 1.1 Introduction to Operating System :Concept, Components of Computer System 1.2 Role of Operating System 1.3 Different Types of Operating Systems- Batch Operating System, Multiprogramming System, Multitasking Operating System, Time Shared System, Multiprocessor Systems, Cluster Systems, Distributed Systems, Real Time Systems, Open Source Operating System, Mobile Operating System 1.4 Command line based OS – DOS ,UNIX GUI based OS -WINDOWS,LINUX **Course Outcome: CO1 Teaching Hours : 05 Marks: 05**
2	TLO 2.1 Start, stop, and restart the given Different Services of Operating System. TLO 2.2 Explain use of the given Components of OS. TLO 2.3 Explain use of the given operating system tool.	**Operating System Components & Structure** 2.1 Operating System Components: Process Management, Main Memory Management, Secondary Storage Management, I/O System Management, File Management. 2.2 Operating-System Services 2.3 Operating System Structure: Simple Structure, Layered, Monolithic, Microkernel 2.4 System Calls - Concept, Types & Uses of System Call: Process Control, File Management, Device Management, Information Maintenance, Communication. **Course Outcome: CO2 Teaching Hours : 06 Marks: 07**
3	TLO3.1 Explain functions carried out in the given process state. TLO 3.2 Describe the function of the given component of process stack 1n PCB. TLO 3.3 Explain characteristics of the given multithreading model. TLO 3.4 Descrlbe method of executing the given process command with example.	**Process Management** 3.1 Process-Concept, Process States, Process Control Block 3.2 Process Scheduling- Scheduling Queues, Schedulers, Context Switch. 3.3 Inter-Process Communication- Introduction, Shared Memory System & Message Passing System 3.4 Threads – Benefits, Users And Kernel Threads 3.5 Multithreading Models – Many To One, One To One, Many To Many. **Course Outcome: CO3 Teaching Hours : 06 Marks: 08**

4	TLO4.1 Justify the need and objective of given job scheduling criteria with relevant example. TLO 4.2 Explain with example the procedure of allocating CPU to the given process using the specified OS. TLO 4.3 Calculate turnaround time and average waiting time of the given scheduling algorithm. TLO 4.4 Explain functioning of the given necessary condition leading to deadlock.	**CPU Scheduling & Deadlock** 4.1 Scheduling Objectives, Concept, CPU and I/O Burst Cycles, Pre-Emptive & Non- Pre-Emptive Scheduling, Scheduling Criteria. 4.2 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 4.3 Deadlock: System Model, Necessary Conditions Leading to Deadlocks, Deadlock Handling, Deadlock Prevention 4.4 Deadlock Avoidance: Safe State, Resource allocation Graph Bankers Algorithm , Data Structure Of Banker's algorithm, Safety algorithm, Resource-Request Algorithm, Illustrative Examples **Course Outcome: CO4 Teaching Hours : 12 Marks: 18**
5	TLO 5.1 Describe the working of specified memory management function. TLO 5.2 Explain characteristic of the given memory management techniques. TLO 5.3Write algorithm for the given page replacement technique. TLO5.4 Calculate Page fault for the given page reference string	**Memory Management** 5.1 Background – Basic Memory Hardware, Address Binding, Logical& Physical Address Space, 5.2 Swapping 5.3 Contiguous Memory Allocation, Fragmentation. 5.4 Paging, Page Table, Page Fault, Segmentation 5.5 Virtual Memory – Concept, Demand Paging. 5.6 Page Replacement Algorithms- First In First Out (FIFO), Least Recently Used (LRU), Optimal Page Replacement, Not Recently Used (NRU**).** **Course Outcome: CO5 Teaching Hours : 12 Marks: 18**
6	TLO 6.1 Explain structure of the given file system with example. TLO 6.2 Descrlbe mechanism of the given file access method. TLO 6.3 Explain procedure to create and access directories and assign the given files access permissions.	**File System** **6.**1 File – Concepts, Attributes, Operations, Types, File System Structure, 6.2 Access Methods – Sequential, Direct, Swapping 6.3 File Allocation Methods- Contiguous , Linked, Indexed 6.4 Directory Structure – Single Level, Two Level ,tree-structured directory **Course Outcome: CO6 Teaching Hours : 04 Marks: 04**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO1.1 Identify type of OS suitable for given type of application	Compare various operating systems according to different criteria **Operating systems to be considered** - MS-DOS, Windows selected versions, OS/2, Mac OS, Linux, Android, iOS etc. **Criteria**- Creator/ Produced by, Initial Public release, Target system type, File system supported, Kernel type, GUI default ,Update management, Native APIs, Non-native APIs supported through subsystems, etc.	2	CO1
2	LLO2.1 Install and Configure different Operating systems.	Install and configure Windows, Linux (or alike) operating system.	4	CO1
3	LLO3.1 Execute Linux basic commands	3.1 Execute general purpose commands date, time, cal, clear, banner, tty, script, man. 3.2 Work with multiple linux terminals and basic commands: who, who am I, login, passwd, su, pwd. 3.3 Execute text processing commands tr, wc, cut, paste, sort, cmp, diff.	2	CO2
4	LLO4.1 Execute File and directory commands in Linux.	Execute file and directory manipulation commands ls, rm, mv, cp, join, split, cat (file saving and redirection operator), head, tail, touch, diff, comm., pr, chmod, mkdir, rmdir, cd, pwd, dir, cmp. (Use wild card character).	4	CO2
5	LLO5.1 Execute process commands	Execute process commands- ps, wait, sleep, exit, kill.	2	CO3
6	LLO6.1 Implementation of IPC	Write a program to implement IPC through Shared Memory.	2	CO3
7	LLO7.1 Use Operating system services	7.1 Use Operating system services(Editor, GUI, File handling.) 7.2 Run commands to start, stop, and restart the specified service in Linux	2	CO2
8	LLO8.1Implement CPU Scheduling algorithms	Write a program to implement First Come First Serve, Shortest job first and Round Robin Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput.(Given the list of Processes, their CPU burst times) **Process** / **Burst Time** P1 / 6 P2 / 8 P3 / 7 P4 / 3	6	CO4

9	LLO9.1 Implement Page Replacement Algorithms	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) 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6	2	CO5
10	LLO10.1 Implement Page Replacement Algorithms	Write a program to implement Last in first out (LIFO) 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) 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6	2	CO5

VI. Micro Project :

1. Design a file Explorer having advanced features like file Compression, Encryption and permission.
2. Develop a Process Scheduling Simulator.
3. Design a chat Application.

Any other microproject suggested by Subject Faculty.

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- TH- Progressive /Periodic Test each of 20 Marks
- FA - Continuous Assessment of Practicals for 25 Marks
- SL - Continuous Assessment of Self Learning for 25 Marks

Summative Assessment (Assessment of Learning)

- TH - Term End examination of 60 Marks
- PR- Term End Practical examination of 25 Marks

VIII. Suggested CO-PO Matrix form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	2	2	2	2	1	3	2	2
CO2	3	2	2	2	2	2	1	3	2	2
CO3	3	2	2	2	2	2	1	3	2	2
CO4	2	3	2	2	2	2	1	3	2	2
CO5	2	2	2	2	2	2	1	3	2	2
CO6	2	2	2	2	2	2	1	3	2	2

IX. Suggested Learning Materials / Books

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Operating System Concepts	Abraham Silberschatz, Greg Gagne, Peter B. Galvin Wiley India Limited 10th Edition, April 2018	ISBN: 978-1-119-32091-3/ ISBN: 978-1-119-75313-1
2	Operating Systems: Internals and Design Principles	William Stallings Pearson Education, India, 9th Edition, March 2018	ISBN-13: 9789332518803
3	Modern Operating Systems	Andrew S. Tanenbaum, Herbert Bos, Prentice Hall of India 4th Edition, September 2014	ISBN:1292061421 (ISBN13: 9781292061429)
4	Operating system	Godbole Atchyut S. Tata McGraw-Hill Education, 3rd Edition, 2015	ISBN-13: 9780070702035

X. Learning Websites & Portals

https://www.javatpoint.com/os-tutorial
https://courses.cs.vt.edu/csonline/OS/Lessons/Processes/index.html
https://en.wikipedia.org/wiki/Operating_system
https://computer.howstuffworks.com/operating-system.htm

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Ms. Bhakti R. Khajone	Senior Project Engineer	WIPRO Technology, Pune
2	Mrs. Poonam Vegurlekar	Lecturer in Computer Engg.	Thakur Polytechnic Mumbai
3	Mrs. N. H. Vachani	Lecturer in Computer Engineering	Government Polytechnic

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering (Sandwich Pattern)													
Course Code: CO23110					**Course Title : Software Engineering**								
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2.30 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						Th	**Th**			**PR**	**OR**		
3	---	2	1	6	3	20	20	60	25	--	--	25	150

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. 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.

II. Industry / Employer Expected Outcome

Student will be able to

1. Develop requirement gathering for Software Development.
2. Use various data models.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

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 modeling to create data designs.
CO6	Apply project management principles for software development.

IV.Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	TLO 1.1 State the need of Software. TLO 1.2 State use and need of Software Engineering. TLO 1.3 Describe SDLC. TLO 1.4 Explain Umbrella Activities under Software Development.	**Overview of Software Engineering** 1.1 Notion of Software 1.2 Software Characteristics, Software Applications ,Software myths 1.3 Types of Software 1.4 Software Engineering- Notion and Need 1.5 Software Development Life cycle 1.6 Software Development Generic Process Framework- Typical Umbrella Activities. Identifying a Task Set. 1.7 Some Terminologies ● Product and Process ● Module and Software Components ● Deliverables and Milestones **Course Outcome: CO1 Teaching Hours :07 Marks: 10**
2	TLO 2.1 Compare PSP and TSP. TLO 2.2 Explain Waterfall Model. TLO 2.3 Explain V Model. TLO 2.4 Explain Incremental Process Model. TLO 2.5 Explain Evolutionary Process Model: Prototyping TLO 2.6 Write Selection criteria for software process model.	**Process Models** 2.1 Personal and Team 2.2 Process Models (PSP and TSP) 2.3 Waterfall Model 2.4 V Model 2.5 Incremental Process Model 2.6 Evolutionary Process Model: Prototyping 2.7 Selection criteria for software process model. **Course Outcome: CO2 Teaching Hours: 06 Marks: 08.**
3	TLO 3.1 State Software Engineering Practices and its importance. TLO 3.2 Explain importance of Requirement Gathering and Analysis. TLO 3.3 Explain Developing Use cases for given scenario. TLO 3.4 Need of SRS.	**Software Requirement Engineering** 3.1 Software Engineering Practices and its importance, Core principles. 3.2 Communication Practices, Planning Practices, Modeling Practices , Construction Practices, Software Deployment (Statement and meaning of each principle) 3.3 Requirement Engineering: Requirement Gathering and Analysis, Types of Requirements (Functional, Product, organizational, External Requirements), Eliciting Requirements, Developing Use cases, Building requirement models, Requirement Negotiation, Validation. 3.4 Software Requirement Specification: Need of SRS, Format and its Characteristics. **Course Outcome:CO3 Teaching Hours : 08 Marks:10**
4	TLO 4.1 State need of Data Modelling. TLO 4.2 Explain Fundamental Design Concept. TLO 4.3 Design Data Flow	**Software Modeling and Design** 4.1 Translating Requirement Model into Design Model: Data Modeling. 4.2 Analysis Modeling: Elements of Analysis model. 4.3 Design Modeling: Fundamental Design Concept (Abstraction,

	Diagram (DFD).	Information hiding, Structure, Modularity, Concurrency, Verification, Aesthetics) 4.4 Design Notations: Data Flow Diagram (DFD), Structured Flowcharts and Decision Tables **Course Outcome: CO4 Teaching Hours :07 Marks:10**
5	TLO 5.1 State Importance of Agile Methodology TLO 5.2 Differentiate between Prescriptive and Agile Process Model TLO 5.3 Explain Scrum Process Flow TLO 5.4 Need DevOps. TLO 5.4 State use of JIRA	**Agile Methodology** 5.1 Agile Software Methodology: ● What is Agile Methodology ● Importance of Agile Methodology ● Difference between Prescriptive and Agile Process Model ● Agility Principles 5.2 Adaptive Software Development 5.3 Agile Process Model: Scrum Scrum Process Flow 5.4 Dynamic Systems Development Method (DSDM) 5.5 Introduction to DevOps 5.6 JIRA **Course Outcome: CO5 Teaching Hours : 10 Marks:12**
6	TLO 6.1 Explain The management spectrum-4P's TLO 6.2 Explain Metrics for Size Estimation. TLO 6.3 State need and importance of Risk Management	**Software Project Management** 6.1 The management spectrum-4P's 6.2 Metrics for Size Estimation: Line of Code (LoC), Function Points (FP). 6.3 COCOMO (Constructive Cost Model) 6.4 Risk Management: Risk Identification, Risk Assessment, RMMM Strategy. **Course Outcome: CO6 Teaching Hours : 07 Marks:10**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number Of hrs.	Relevant COs
1	LLO 1.1 Form Problem statement.	1. Write problem statement to define the project title with bounded scope of the project.	02	CO1
2	LLO 2.1Select process models.	2. Select relevant process models to define activities and related tasks set for assigned project.	02	CO2
		3. Prepare report on importance of V model in software development with respect to selected project.	02	
		4. Prepare report on importance of Incremental model in software development with respect to selected project.	02	
3	LLO 3.1Prepare Software Requirement Specification	3. Prepare broad SRS (Software Requirement Specification) for Selected project.	04	CO3
4	LLO 4.1Use and apply data Models.	Prepare use cases and draw use case diagram using modeling software tool.	04	CO4
		Develop the activity diagram to represent flow from one activity to another for software development.	02	
		Develop data diagram designs using DFDs(Data flow diagram)	02	
		Draw class diagram and sequence diagram for Selected project.	02	
5	LLO 5.1 Use of Software Development Tools.	Write Use and Importance JIRA.	02	CO5
6	LLO 6.1 Prepare strategy for Risk Management	Identify risks involved in the project and prepare RMMM plan.	02	CO6
		Estimate cost of the project using COCOMO approach for the assigned project.	02	
		Create Small Application For frame Create Small Application using graphics in frame	02	

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Develop presentation on selected project.
2. Develop Project report.

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (25 marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (25 marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO- 2	PSO-3
CO1	1	- -	--	1	2	1	3	3	2	3
CO2	3	2	3	3	2	2	3	3	3	3
CO3	3	2	3	3	2	2	3	3	3	3
CO4	3	2	3	3	2	2	3	3	2	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Roger Pressman	Software Engineering	Mc-Graw Hill
2	Elias Awad	System Analysis and Design	Galgotia Publications

X. Learning Websites & Portals

1. https://books.google.co.in/books?id=bL7QZHtWvaUC&printsec=copyright&redir_esc=y#v=onepage&q&f=false
2. https://link.springer.com/book/10.1007/978-1-84800-198-5

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Ms. P. S. Sadafule	Lecturer in Computer Engineering	Government Polytechnic, Mumbai
2	Mrs. V.A Patil	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

GOVERNMENT POLYTECHNIC MUMBAI
GPM
ESTD. 1960
TRANSFORM KNOWLEDGE INTO WORK

Programme: Diploma in Computer Engineering and Information Technology (Sandwich Pattern)													
Course Code : CO23111						**Course Title : Advanced Java Programming**							
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2Hrs.30 Min)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
2	--	4	--	6	3	--	--	--	50	50#	--	--	100

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:

1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

I. 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.

II Industry / Employer Expected Outcomes : Students will be able to

1. Develop Network Programming.
2. Develop web applications using servlet and JSP

III Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CO1	Develop Multithreading programs.
CO2	Develop Networking applications using HTTP, UDP and TCP/IP Sockets
CO3	Develop Applications using Remote Method Invocation
CO4	Develop Web Applications using Servlets
CO5	Develop Web Applications using JSP

IV Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Describe Java Thread Model TLO 1.2 Learn Thread Priorities TLO 1.3 Create Multiple Threads using Thread class and Runnable class TLO 1.4 Learn wait()notify and notifyAll() TLO1.5 .Understand ThreadPool and ExecutorService	**Multithreaded Programming** 1.1 The java Thread Model 1.2 Thread Priorities 1.3 Thread Class and Runnable Interface 1.4 wait, notify and notifyAll Methods 1.5 ThreadPool and ExecutorService
	Course Outcome : CO1	**Teaching Hours : 4hrs**
2	TLO 2.1 Learn Networking Classes and Interfaces TLO 2.2 Learn and apply InetAddress TCP/IP Client Sockets TLO 2.3 .Learn and apply URLand URLConnection , HttpURLConnection TLO 2.4 . Apply The URI Class TCP/IP Server Sockets Datagrams DatagramSocket , DatagramPacket Classes	**Networking** 2.1 The Networking Classes and Interfaces 2.2 InetAddress: Inet4Address and Inet6Address 2.3 TCP/IP Client Sockets 2.4 URL and URLConnection 2.5 HttpURLConnection The URI Class 2.6 TCP/IP Server Sockets 2.7 Datagrams: DatagramSocket , DatagramPacket Classes
	Course Outcome : CO2	**Teaching Hours : 6hrs**

3	TLO 3.1 TLO Understand The RMI Architecture and Factory Design Pattern TLO 3.2 Understand Stub and Skeleton TLO 3.3 Learn and apply Remote Interface , Objects ,Class , RMIClient and RMIServer. TLO 3.4 Develop Client Server Application using RMI	**Java Remote Method Invocation** 3.1 The RMI Architecture and Factory Design Pattern 3.2 Stub and Skeleton 3.3 The Remote Interface 3.4 Naming Remote Objects, 3.5 Implementation class 3.6 RMIClient and RMIServer 3.7 Client Server Application Development using RMI
	Course Outcome : CO3	**Teaching Hours : 6hrs**
4	TLO 4.1 Learn The Life Cycle of a Servlet. TLO 4.2 Create a Simple Servlet TLO 4.3 Learn and apply the Servlet API TLO 4.4 Learn and apply Cookies TLO 4.5 Understand Session Tracking	**Servlets** 4.1 The Life Cycle of a Servlet. 4.2 Creating a Simple Servlet 4.3 The Servlet API: 4.4 The javax. servlet Package : • Servlet Interface, • ServletConfig Interface , • ServletContext Interface , • ServletRequest Interface , • ServletResponse Interface , • GenericServlet Class , • Servlet Exception Classes , • Reading Servlet Parameters 4.5 The javax.servlet.http Package 4.6 HttpServletRequest Interface 4.7 HttpServletResponse Interface 4.8 The HttpSession Interface 4.9 The Cookie Class 4.10 Session Tracking
	Course Outcome : CO4	**Teaching Hours : 8hrs**

5	TLO 5.1 Understand basic concepts of JSP TLO 5.2 Learn Tab Based Approach TLO 5.3 Create Simple JSP TLO 5.4 Learn and apply JSP expressions, variables	**Introduction to Java Server Pages** 5.1 Understanding JSP: • Advantages of JSP over Servlet • Introduction the Tag-Based Approach 5.2 Creating a simple JSP Page 5.3 Using out and Page Directives 5.4 JSP expressions, variables 5.5 JSP-generated servlet 5.6 Implicit Objects 5.7 The JSP Life Cycle 5.8 A thought on Scriptlets 5.9 useBean , setProperty and getProperty Methods
	Course Outcome: CO5	**Teaching Hours : 6hrs**

V Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	**Practical/Tutorial/Laboratory Learning Outcome (LLO)**	**Laboratory Experiment / Practical Titles / Tutorial**	**Number of hrs.**	**Relevant COs**
1	LLO 1.1 Develop Programs to implement methods of Thread class LLO 1.2 Develop Multithreading program using Runnable interface	1.1 Write a Java program to implement following methods of Thread class . a)getName() b)getPriority() c)isAlive() d)join() e)run() f)sleep() g)start 1.2 Write a Java program to create Multiple Threads using Runnable Interface.	8	CO1
2	LLO 2.1 Develop Networking programs using TCP/IP Client Socket and TCP/IP Server Sockets	**Networking** 2.1 Develop a Java Application in which TCPClient will send a text message and TCPServer will receive it. 2.2 Add a functionality to the Java	12	CO2

		Application in 2.1 using which TCPServer will send a text message and TCPClient will receive it. Add a functionality to the Java Application in 2.2 using which TCPServer will advertise the TCPCLients associated with it.		
3	LLO 3.1 Develop program using RMI Client and RMI server	**Java Remote Method Invocation** 3.1 Create a distributed application using RMI where the client will handshake with the server by invoking the remote method public void sayHello() where client and server are on different hosts in the same network. 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.	12	CO3
4	LLO 4.1 Develop Web Application Development using Servlet LLO 4.2 Develop servlet programs using Prepared Statement and Result set interface. LLO 4.3 Develop servlet programs to create session using HttpSession LLO 4.4 Develop servlet program for session Tracking using Cookies	**Web Application Development using Servlet** 4.1 Create a Java Web Application in an IDE. 4.2 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. 4.3 Display the server port and protocol number in the browser in scrolling from right to left format. 4.4 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. 4.5 Write a program to demonstrate the use of PreparedStatement and Resultset interface. 4.6 Write a program to create Session using HttpSession class. 4.7 Write a program to implement Session tracking using Cookies.	12	CO4
5	LLO 5.1 Develop Web Application Development using JSP LLO 5.2 Create Java Beans.	**Web Application Development using JSP** 5.1 Create a Java Web Application in an IDE. 5.2 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.	16	CO5

		5.3 Modify registerEmployee.jsp in 6.2 to store the inputs in the 'employees' table you have created in the database in 3.2. 5.4 Create a Java Bean EmployeeBean with the properties given in 5.2. Modify registerEmployee.jsp to use the useBean, getProperty and setPropety.		

Note: if any

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

Micro Project

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,

1. Client Server Application TCP/ IP or UDP
2. RMI Client Server Application
3. Web Application using Servlet.
4. Web Application using JSP .

VIII Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators(___ marks)

Summative Assessment (Assessment of Learning)

End term External Practical examination, Viva-voce, Workshop performance (__marks)

IX. CO Vs PO and CO Vs PSO Mapping

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

X. Suggested Learning Materials / Books

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Java: The Complete Reference, Eight and onward Edition	Herbert Schildt	978-0-071-80855-2

XI. Learning Websites & Portals

E-References:

1) https://docs.oracle.com/javase/tutorial/essential/concurrency/index.html
2) https://docs.oracle.com/javase/tutorial/essential/concurrency/forkjoin.html
3) https://docs.oracle.com/javase/tutorial/essential/concurrency/QandE/questions.html
4) https://docs.oracle.com/javase/tutorial/networking/overview/networking.html
5) https://docs.oracle.com/javase/7/docs/platform/rmi/spec/rmiTOC.html
6) https://docs.oracle.com/javaee/7/tutorial/servlets.htm
7) https://docs.oracle.com/en/middleware/fusion-middleware/weblogic-server/12.2.1.4/wbapp/basics.html#GUID-41C6F1CE-5E16-49CC-9623-70C4199FFD9F
8) https://docs.oracle.com/javaee/7/tutorial/jsf-page.htm

XII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No.	Name	Designation	Institute/Organisation
1.	Ms. Varshali Cholake-Landge	Senior Software Engineer	Volkswagen IT Services India Pvt. Ltd.
2.	Mr. Mohan Khedkar	Lecturer in IT	Government Polytechnic, Nashik
3.	Mrs Vandana S. Lokhande	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
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering and Information Technology (Sandwich Pattern)													
Course Code: CO23112						**Course Title: Next Generation Database**							
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2Hrs.30 Min)**	**FA-PR**	**SA**		**SLA**	**Total**
						TH1	**TH2**			**PR**	**OR**		
3	--	2	1	6	3	20	20	60	25	25#	--	25	175

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

Note:
1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self-learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

I. Rationale

A key component of information systems is its database management system. This course encompasses the study of advanced technologies in databases. 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.

II. Industry / Employer Expected Outcome

Engineers applying DBMS concepts should proficiently solve real-world problems, enhancing decision- making, design and innovation with precision and efficiency.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CO1	Describe 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.

IV. Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Understand the difference between relational and non-relational database system. TLO 1.2 Describe the types of NoSQL. TLO 1.3 Describe CAP theorem. TLO 1.4 Describe BASE properties. TLO 1.5 State the benefits and applications of NoSQL databases.	**Non-relational database system** 1.1 Relational (RDBMS) Vs. Non-relational database system (NoSQL). Introduction to NoSQL. 1.2.1 Types of NoSQL. Key-value database. Column Oriented database. Graph Oriented database. Document Oriented database. CAP theorem. BASE properties. Benefits of NoSQL. Applications of non-relational databases.
	Course Outcome: CO1	**Teaching Hours: 06** **Marks: 10**
2	TLO 2.1 Understand the basics of MongoDB. TLO 2.2 Describe Basic operations in MongoDB. TLO 2.3 Describe MongoDB CRUD Operations TLO 2.4 Learn the validation of JSON schema. TLO 2.5 Understand Data Modeling and Data Relationships in MongoDB. TLO 2.6 Understand the concept of array in MongoDB.	**Introduction to MongoDB** MongoDB overview. Features of MongoDB. RDBMS concepts mapping to MongoDB. BSON and JSON document formats. MongoDB Datatypes Basic operations in MongoDB • Create and Drop Database. • Create and Drop Collection. MongoDB CRUD Operations • Create • Read • Update • Delete JSON Schema Validation MongoDB Data Modeling and Data Relationships • Embedded document. • Normalized model (Reference document.) Arrays in MongoDB Querying Array elements.
	Course Outcome: CO2	**Teaching Hours: 13** **Marks: 16**

3	TLO 3.1 Study the methods in MongoDB. TLO 3.2 Describe indexing in MongoDB. TLO 3.3 Describe aggregation framework. TLO 3.4 Describe CAPPED collection. TLO 3.5 Describe replication in MongoDB. TLO 3.6 Describe Sharding in MongoDB. TLO 3.7 Study database backup and restore concepts.	**Advanced MongoDB** 3.1 Methods in MongoDB Projection Skip Limit Sort Save Gridfs 3.2 Indexing Types of Index Covered queries Aggregation Framework Pipeline operations MapReduce CAPPED Collection 3.5 Replication- Replica Set Configuration, Components of Replica Set 3.6 MongoDB Scaling Horizontal Scaling- Sharding Vertical Scaling 3.7 Database backup and restore
	Course Outcome: CO3	**Teaching Hours: 12** **Marks: 16**
4	TLO 4.1 Learn the concept of Cloud Databases. TLO 4.2 Describe benefits of Cloud database. TLO 4.3 Learn to deploy MongoDB on cloud.	**Hosting MongoDB on Cloud** Introduction to Cloud database. Benefits of Cloud database/DBaaS MongoDB Atlas Deployment of Free Cluster using MongoDB Atlas. Cluster Configuration. Connect Cluster to Mongo Shell. Access and modify databases on Cloud through Mongo Shell.
	Course Outcome : CO4	**Teaching Hours : 05** **Marks: 08**

5	TLO 5.1 Understand the difference between Distributed database system and Centralized database system. TLO 5.2 Describe the classification of distributed database. TLO 5.3 Describe Architectural models of DDBMS. TLO 5.4 Describe Distributed data storage Techniques.	**Distributed databases** .1 Introduction • Distributed database system vs. Centralized database system. Features of distributed database Classification Homogeneous DDBMS Heterogeneous DDBMS Architectural models of DDBMS Client –Server architecture Peer to Peer architecture Multi DBMS (MDBS) architecture Distributed data storage techniques Fragmentation: Horizontal, Vertical, Hybrid Replication Applications of Distributed databases.
	Course Outcome: CO5	**Teaching Hours: 09** **Marks: 10**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial	Number of hrs.	Relevant COs
1	LLO 1.1 Install MongoDB.	Installation of MongoDB.	02	CO1
2	LLO 2.1 Create MongoDB database. LLO 2.2 Perform CRUD operations on created collections.	Create Database and Collections in MongoDB. 2.2 Perform CRUD-Create, Read, Update and Delete operations on created collections.	04	CO2
3	LLO 3.1 Implement different MongoDB methods on document.	Implementation of different MongoDB methods on document: Projection, Skip, Limit, Sort and Save.	04	CO3
4	LLO 4.1 Deploy MongoDB database on cloud. LLO 4.2 Perform CRUD operations on database.	4.1 Host MongoDB on Cloud: Create MongoDB Atlas account. Create a new Cluster. Configure Cluster. Create Database users. Connect created cluster with Mongo Shell Create Database and Collection. 4.2 Perform CRUD operations on created Collection (through Mongo Shell and through MongoDB Atlas)	04	CO4

5	LLO 5.1 Perform fragmentation operation on database.	Perform fragmentation operation on database (Distributed database using SQL queries): Vertical fragmentation. Horizontal fragmentation. Hybrid fragmentation.	02	CO5
6	LLO 6.1 Create MongoDB Collection containing embedded documents and reference documents. LLO 6.2 Perform CRUD operations on created Collection.	Create a Collection containing embedded documents and arrays. Perform CRUD operations on created Collection. 6.3 Create Collections with reference documents.	02	CO2
7	LLO 7.1 Use GridFS method to store MP3 file.	Store any MP3 file using Gridfs method.	02	CO3
8	LLO 8.1 Execute aggregate functions on collection. LLO 8.2 Implement pipeline operations on collection.	Execute aggregate functions on collection. 8.2 Implement pipeline operations on collection.	04	CO3
9	LLO 9.1 Create different types of Index on Collection. LLO 9.2 Execute Covered queries on Collection.	Create different types of Index on Collection: Simple/Single index, Compound index, Multikey index. 9.2 Execute Covered queries on Collection.	02	CO3
10	LLO 10.1 Create database backup and restore data.	Execute commands to create database backup and to restore data.	02	CO3
11	LLO 11.1 Execute replication operation on database.	Perform Replication operation on database.	02	CO3

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Write a report on different types of NoSQL databases and its applications.
2. Create database to store data of an organization and perform different operations on it.
3. Create a database to store data from any social media site.

VII. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Non-relational database system	4	6	-	10
2	Introduction to MongoDB	4	4	8	16
3	Advanced MongoDB	2	6	8	16
4	Hosting MongoDB on Cloud	4	-	4	8
5	Distributed databases	2	4	4	10
	Total	**16**	**24**	**20**	**60**

VIII. Assessment Methodologies/Tools

Formative Assessment (Assessment for Learning)

- TH- Progressive /Periodic Test each of 20 Marks
- TL - Continuous Assessment of Tutorials for 25 Marks
- SL - Continuous Assessment of Self Learning for 25 Marks

Summative Assessment (Assessment of Learning)

- **TH -** Term End examination of 60 Marks

IX. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)						
	PO-1 Basic and Discipline Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**
CO1	3	-	-	-	-	-	2
CO2	3	2	2	-	-	2	2
CO3	3	2	2	-	-	2	2
CO4	2	2	2	-	-	2	2
CO5	2	2	2	-	-	2	1

X. Suggested Learning Materials / 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	

XI. Learning Websites & Portals

1. www.MongoDB.com
2. https://docs.oracle.com

XII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Vrushali A. Patil	Lecturer in Computer Engineering	Govt. Polytechnic Mumbai
2	Mr. Samit Kumar Shukla	Project Manager	Cognizant Technology Services
3	Mrs. Megha G. Yawalkar	Lecturer in Computer Engineering	Govt. Polytechnic Avasari

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering and Information Technology (Sandwich Pattern)												
Course Code: CO23604					**Course Title: Mobile Application Development**							
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (02.30 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
02	--	04	--	06	03	--	--	50	--	50#	--	100

Total IKS Hrs. for course:

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination
Note:
1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Mobile Application Development has been a source of different opportunities and challenges for soft developers since last decade. Although there very few platforms are available for application development, Android OS being open source has become very popular and widely used platform among all. This course aims at making students able to develop professional quality Android Apps and generate revenue out of it.

II. Industry / Employer Expected Outcome

Students will be able to

1. Understand the Mobile Operating Systems
2. Understand why to learn Android OS
3. Understand Android Platform Architecture
4. Understand basic concepts of Android App Development
5. Develop Android Apps to solve real world problems
6. Deploy Android Apps for public
7. Earn revenue out of the App Deployment

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Decide the appropriate version of Android OS to be used for App Development
CO2	Develop Android Apps using UI Components and Event Listeners
CO3	Perform Remote Database Operations using Firebase
CO4	Develop Apps using NavigationDrawer and RecyclerView
CO5	Access hardware and sensors for the App Development

IV. Course Content Details:

Unit No.	Theory Learning Outcomes	Topics / Sub-topics
1	TLO1.1: Understand latest trends in Mobile Application Development TLO 1.2: Understand different platforms in Mobile Application Development TLO 1.3: Understand why to learn Android TLO 1.4: Understand Android Studio, Android versions, SDK Manager and Android Project Structure	**Introduction** 1.1 Latest Trends in Mobile Application Development 1.2 Different Platforms in Mobile Application Development: Apple iOS, Windows Mobile OS and Android OS Architecture 1.3 Why Android? 1.4 Installing Android Studio 1.5 Android versions: features and limitations, number of devices currently running on each version and how to choose a specific version for a given App Development 1.6 Android SDK Manager 1.7 Android Project Structure 1.8 Create "Hello Android World" application **Course Outcome: CO1 Teaching Hours : 2 hrs**
2	TLO 2.1: Understand Android Platform Architecture TLO 2.2: Understand Logical components of Android app TLO 2.2: Understand Android Tool Repository TLO 2.3: Understand Files: Manifest, Java, Res, Gradle TLO 2.4: Understand AVD Creation TLO 2.5: Run Apps on an Android Phone TLO 2.6: Publish Apps on Google Play Store or on website	**Android Architecture** 2.1 Android Platform Architecture 2.2 Logical components of Android app 2.3 Android Tool Repository 2.4 Files: Manifest, Java, Res, Gradle 2.5 AVD Creation 2.6 Running Apps on an Android Phone 2.7 Publishing Apps on Google Play Store or on website **Course Outcome: CO1 Teaching Hours : 2 hrs**
3	TLO 3.1: Understand XML Design TLO 3.2: Understand Activity life cycle TLO 3.3: Use Layouts: RelativeLayout, LinearLayout TLO 3.4: Use UI resources, String resources, Image resources TLO 3.5: Use Views: Button, TextView, ImageView, EditText, Checkbox, Spinner, Date and Time Picker, ListView TLO 3.6: Understand Event handling associated with Views, AlertDialog, Navigation between Activities, ActionBar TLO 3.7: Use Intents and its types TLO 3.8: Use Menu: Popup, Context, Option TLO 3.9: Use Fragments, Fragment Life cycle, Interaction between Fragments TLO 3.10: Use Types of Animations on Views: Scale, Rotate, Translate, Alpha	**UI Components and Event Listeners** 3.1 Overview of XML Design 3.2 Activity life cycle 3.3 Layouts: RelativeLayout, LinearLayout 3.4 UI resources, String resources, Image resources 3.5 Views: Button, TextView, ImageView, EditText, Checkbox, Spinner, Date and Time Picker, ListView 3.6 Common attributes of View 3.7 Event handling associated with Views, AlertDialog, Navigation between Activities, ActionBar 3.8 Intents 3.8.1 Implicit Intents: Share, Dial Number 3.8.2 Explicit Intents: Splash, Activity to Activity 3.9 Menu: Popup, Context, Option 3.10 Fragments, Fragment Life cycle, Interaction between Fragments 3.11 Types of Animations on Views: Scale, Rotate, Translate, Alpha **Course Outcome: CO2 Teaching Hours : 6 hrs**

4	TLO 4.1: Use Internal and External Data Storage in Android TLO 4.2: Use SharedPreferences in Android TLO 4.3: Understand Persistent data storage in Android TLO 4.4: Perform remote database operation using Firebase	**Data Storage Management** 4.1 Internal and External File storage Operation 4.2 Shared Preference 4.3 How to use Shared Preferences 4.4 Maintain login session using Shared Preferences 4.5 SQLite database **4.6** Firebase and Remote Database Operations **4.7** Notifications using Firebase **Course Outcome: CO3 Teaching Hours : 4 hrs**
5	TLO 5.1: Use NavigationDrawer in Android TLO 5.2: Use RecyclerView in Android	**NavigationDrawer and RecyclerView** 5.1 What is NaigationDrawer? 5.2 Adding /menu to NavigationDrawer 5.3 Customizing NvigationDrawer 5.4 RecyclerView 5.5 Creating ListView and GridView using RecyclerView 5.6 LayoutManager in RecyclerView **Course Outcome: CO4 Teaching Hours : 4 hrs**
6	TLO 6.1: Access Internet, calls and messages in Android Apps TLO 6.2: Access Multimedia in Adnroid Apps TLO 6.3: Access Bluetooth, WiFi and GPS in Android Apps TLO 6.4: Access sensors and sensor data in Android Apps	**Accessing Hardware/ Sensors and Sensor Data** 6.1 Internet. Call, Messages 6.2 Multimedia: Audio, Video, Camera 6.3 Bluetooth, Wifi, GPS 6.4 Sensors 6.4.1 Motion Sensors: Gyroscope, Accelerometer, Gravity Sensor 6.4.2 Position Sensors: Orientation Sensors, Magnetometers, Proximity Sensor 6.4.3 Environmental Sensors: Ambient Air Temperature, Pressure, Illumination, Humidity 6.5 Sensor Framework and Best Practices for accessing Sensor and Sensor Data **Course Outcome: CO5 Teaching Hours : 12 hrs**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1: Download Install and Configure Android Studio on Windows/ Linux environment.	Download Install and Configure Android Studio on Windows/ Linux environment.	04	CO1
2	LLO 2: Building Simple User Interface using UI Widgets, Layouts and Adapters. Use Material Design Pattern.	Building Simple User Interface using UI Widgets, Layouts and Adapters. Use Material Design Pattern.	04	CO2
3	LLO 3: Develop an application having animation on views.	Develop an application having animation on views.	04	CO2
4	LLO 4: Develop an Android App in which a user can register. After registration user can login with the credentials supplied for registration using Firebase.	Develop an Android App in which a user can register. After registration user can login with the credentials supplied for registration using Firebase.	06	CO3

5	LLO 5: Develop an Android App to your college display a NavigationDrawer with Menus like About Us, Departments, Student Section, Contact Us, etc.	Develop an Android App to your college display a NavigationDrawer with Menus like About Us, Departments, Student Section, Contact Us, etc.	04	CO4
6	LLO 6: Design an android based application to display contact list in RecyclerView	Design an android based application to display contact list in RecyclerView	06	CO4
7	LLO 7: Develop an application to make and receive calls on mobile.	Develop an application to make and receive calls on mobile.	04	CO5
8	LLO 8: Design an android based application to take a snapshot by using the Camera in your mobile.	Design an android based application to take a snapshot by using the Camera in your mobile.	04	CO5
9	LLO 9: Develop an application to access Bluetooth and Wi-Fi.	Develop an application to access Bluetooth and Wi-Fi.	04	CO5
10	LLO 10: Design an android based application to demonstrate GPS services using Google Maps.	Design an android based application to demonstrate GPS services using Google Maps.	04	CO5
11	LLO 11: Develop an application to access Accelerometer, Gyroscope, Orientation Sensors and to display data received from each sensor.	Develop an application to access Accelerometer, Gyroscope, Orientation Sensors and to display data received from each sensor.	06	CO5
12	LLO 12: Publish all the above apps on your own website. (To be performed side by side along with all the experiments above)	Publish all the above apps on your own website. (To be performed side by side along with all the experiments above)	02	CO1`
13	LLO 13: Mini Project (To be performed side by side along with all the experiments above)	Mini Project (To be performed side by side along with all the experiments above)	08	ALL

Note: if any

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Micro Project

   (To be performed side by side along with all the experiments above)

VII. Specification Table: NA

VIII. Assessment

Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators(___ marks)

Summative Assessment (Assessment of Learning)

- End term examination, Viva-voce, Workshop performance (__marks)

IX. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	01	02	03	01	-	01	03	01	02	02
CO2	01	03	03	02	-	03	03	02	02	03
CO3	01	03	03	02	-	03	03	03	03	03
CO4	-	03	03	02	01	03	03	03	03	03
CO5	-	03	03	02	01	03	03	03	03	03
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

X. Suggested Learning Materials / Books: NA

XI. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://developer.android.com/docs	Link for official documentation website for Android Development
2	https://developer.android.com/guide/topics/manifest/uses-sdk-element#ApiLevels	Link for understand which API level to use while developing Android App
3	https://developer.android.com/guide/topics/sensors/sensors_overview	Link to overview sensor for Android App Development

XII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Vivek Pawar	Director and CEO	Atoconn Systems Pvt. Ltd.
2	Prof. Nirmala Shinde-Baloorkar	Assistant Professor, Department of Computer Engineering	K. J. Somaiya College of Engineering
3	Mrs. Jijnasa S. Patil	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
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

GOVERNMENT POLYTECHNIC MUMBAI
GPM
ESTD. 1960
TRANSFORM KNOWLEDGE INTO WORK

Programme: Diploma in Computer Engineering (Sandwich Pattern)													
Course Code: CO23201	**Course Title: Web Development using PHP**												
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**FA-TH**	**SA-TH (2.30 Hrs.)**	**FA- PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
2	---	2	2	6	3	--	--	--	50	25#	--	25	100

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination
Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

PHP is a general purpose, server-side scripting language run a web server that's designed to make dynamic pages and applications. PHP as a web development option is secure, fast and reliable. In the growing field of Web technology, it is essential for every Diploma pass out to learn PHP Language to help them build interactive web applications. This course is designed to inculcate web-based applications development skills in students using server-side scripting with PHP.

II. Industry / Employer Expected Outcome

Student will be able to

Develop simple web-based application using PHP language.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Develop program using control flow statements.
CO2	Perform operations based on arrays and graphics.
CO3	Develop programs by applying various object-oriented concepts.
CO4	Use form controls with validation to collect user's input.
CO5	Perform database operations in PHP.

IV.Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	**TLO 1.1.** Write simple PHP program to solve the given expression. **TLO 1.2.** Use relevant decision-making control statement to solve the given problem. **TLO 1.3.** Solve the given iterative problem using relevant loop statement.	**Basics of PHP** 1.1 History and Advantages of PHP, Syntax of PHP. 1.2 Variables, Data types, Expressions and operators, constants. 1.3 Decision making Control statements - if, if-else, nested if, switch, break and continue statement. 1.4 Loop control structures-while do while, for and for each **Course Outcome: CO1 Marks:10 Teaching Hours: 4 hrs.**
2	**TLO 2.1.** Manipulate the given type of arrays to get the desired result. **TLO 2.2** Apply implode, explode functions on the given array. **TLO 2.3.** Apply the given string functions on the character array. **TLO 2.4** Scale the given image using graphics concepts/ functions.	**Arrays, Functions and Graphics** 2.1 Creating and Manipulating Array, Types of Arrays-Indexed, Associative and Multi-dimensional arrays 2.2 Extracting data from arrays, implode, explode, and array flip. 2.3 Traversing Arrays 2.4 Function and its types-User defined function, Variable function and Anonymous function. 2.5 Operations on String and String functions: str_word_count(), strlen(), str rev(), strpos(), str_replace(), ucwords(), strtoupper(), strtolower(), strcmp(). 2.6 Basic Graphics Concepts, Creating Images, Images with text, Scaling Images, Creation of PDF document **Course Outcome: CO2 Marks: 12 Teaching Hours: 6 hrs.**
3	**TLO 3.1.** Write constructor and destructor functions for the given problem in PHP. **TLO 3.2.** Implement inheritance to extend the given base class. **TLO 3.3.** Use overloading/ overriding to solve the given problem. **TLO 3.4** Clone the given object.	**Object Oriented Concepts in PHP** 3.1 Creating Classes and Objects 3.2 Constructor and Destructor 3.3 Inheritance, Overloading and Overriding, Cloning Object. 3.4 Introspection, Serialization **Course Outcome: CO3 Marks: 12 Teaching Hours: 6 hrs.**

4	**TLO 4.1.** Use the relevant form controls to get user's input. **TLO 4.2.** Design web pages using multiple Forms for the given problem. **TLO 4.3.** Apply the given validation rules on form. **TLO 4.4** Set/modify/ delete cookies using cookies attributes. **TLO 4.5** Manage the given session using session variables.	**Creating and validating forms** 4.1 Creating a webpage using GUI Components, Browser Role-GET and POST methods, Server Role 4.2 Form controls: text box, text area, radio button, check box, list, buttons 4.3 Working with multiple forms: • A web page having many forms • A form having multiple submit buttons. 4.5 Cookies-Use of cookies, Attributes of cookies, create cookies, modify cookies value, and delete cookies. 4.6 Session-Use of session, start session, get session variables, destroy session. 4.7 Sending E-mail. **Course Outcome: CO4 Marks: 1 Teaching Hours: 8 hrs.**
5	**TLO 5.1.** Create database for the given problem using PHP script. **TLO 5.2.** Insert data in the given database using PHP script. **TLO 5.3.** Apply the specified update operation in database record.	**Database Operations** 5.1 Introduction to MySQL Create a database. 5.2. Connecting to a MySQL database: MySQL database server from PHP. 5.3. Database operations: Insert-data Retrieving the Query result. 5.4. Update and delete operations on data. **Course Outcome: CO5 Marks: 12 Teaching Hours: 06 hrs.**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number Of hrs.	Relevant COs
1	**LLO 1** Configure PHP and execute basic programs.	a. Install and configure PHP, web server, MYSQL. b. Write a program to print "Welcome to PHP". c. Write a simple PHP program using expressions and operators.	02	CO1
2	**LLO 1** Configure PHP and execute basic programs.	Write a PHP program to demonstrate the use of decision-making and looping statements.	02	CO1
3	**LLO** 2**.1** Write programs to work with Indexed array, Associative array and Multidimensional array.	Write a PHP program for creating and manipulating a. Indexed array b. Associative army c. Multidimensional array	02	CO2
4	**LLO 2.2** Apply the use of strings for various operations.	a. Write a PHP program to i. Calculate length of string ii. Count the number of words in a string without using string functions.	02	

		b. Write a simple PHP program to demonstrate use of various built-in string functions.		CO2
5	**LLO 2.3** Demonstrate simple and parameterized functions.	Write a simple PHP program to demonstrate use of Simple function and Parameterized function.	02	CO2
6	**LLO 2.4** create PDF using graphics concepts.	Write a simple PHP program to create PDF document by using graphics concepts.	02	CO2
7	**LLO 3.1** Apply concepts to implement inheritance. **LLO 3.2** Implement Constructor.	Write a PHP program to- a. Inherit members of super class in subclass. b. Create constructor to initialize object of class by using object-oriented concepts	02	CO3
8	**LLO 3.3** Apply concepts to implement Introspection and Serialization.	Write a simple PHP program on Introspection and Serialization.	02	CO3
9	**LLO 4.1** Design Web Page Using Basic form elements.	Design a web page using following form controls: a. Text box, b. Radio button, c. Check box, d. Buttons	02	CO4
10	**LLO 4.1** Design Web Page Using Basic form elements.	Design a web page using following form controls: a. List box, b. Combo box, c. Hidden field box	02	CO4
11	**LLO 4.2** Perform form validation.	Develop web page with data validation.	02	CO4
12	**LLO 4.3** Implement cookies and session management.	Write simple PHP program to – a. Set cookies and read it. b. Demonstrate session Management.	02	CO4
13	**LLO 4.4** Implement program to send and receive e-mail.	Write a simple PHP program for sending and receiving plain text message (e-mail).	02	CO4
14	**LLO 5.1** Perform operations on database	Develop a simple application to a. Enter data into database. b. Retrieve and present data from database.	02	CO5
15	**LLO 5.1** Perform operations on database	Develop a simple application to Update, Delete table data from database	02	CO5

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Develop web application for- Sending plain text email, Sending HTML message, Sending e-mails with attachment.
2. Develop web application for Library Management system. - Add book, Display list of books, Search book.
3. Develop web application for Student Feedback System.
4. Develop web application for Employee Pay Management System.

VII. Specification Table:

Unit No.	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basics of PHP	2	4	2	10
2	Arrays, Functions and Graphics	2	4	4	12
3	Object Oriented Concepts in PHP	2	4	8	12
4	Creating and Validating forms	2	4	6	14
5	Database operations	2	2	4	12
Total					60

VIII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (50 marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (25 marks)

IX. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	--	--	3	-	1	2	3	2	3
CO2	3	3	3	2	-	2	2	3	3	3
CO3	3	2	2	2	-	2	2	3	3	3
CO4	3	2	3	3	-	3	3	3	2	3
CO5	2	3	3	1	-	3	3	3	2	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

X. Suggested Learning Materials / Books

Sr. No	Author	Title	Publisher
1	Rasmus Lerdorf, Kevin. T and Peter M.	Programming PHP	O'Reilly, USA, ISBN -978-1-449-39277-2, 2013
2	Holzner, Steven	The Complete Reference PHP (Third Edition covers PHP)	McGraw hill, New Delhi, ISBN 9780070223622, 2008
3	Mc Grath, Mike	PHP and MySQL	McGraw Hill, New Delhi, ISBN-13:978-1259029431
4	Dr. Rajedra Kawle	Advance Web Technology	Devraj Publication, ISBN – 978-93-86492-01-2

XI. Learning Websites & Portals

a. **https://www.w3schools.com/php/default.asp**

b. **https://www.guru99.com/what-is-php-first-php-program.html**

c. **https://www.tutorialspoint.com/php/**

d. **https://tutorialehtml.com/en/php-tutorial-introduction/**

e. **http://www.tizag.com/phpT/**

f. **https://books.goalkicker.com/PHPBook/**

g. **https://codecourse.com/watch/php-basics**

XII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Atul Jadhav	Founder	9TH Legends Pvt, Ltd
2	Mrs. Vinaya Savadekar	Lecturer in Computer Engineering	Government Polytechnic, Mumbai
4	Ms. A. V. Wankar	Lecturer in Computer Engineering	Government Polytechnic, Jalgaon

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering (Sandwich Pattern)												
Course Code: CO23202					**Course Title : Internet Of Things**							
Compulsory / Optional: Optional												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
2	**---**	**2**	**2**	**6**	**3**	**---**	**---**	**50**	**25#**	**--**	**25**	**100**

Total IKS Hrs. for course: 0

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Internet of Things is one of the most widely spread market. This course aims at making students able to create Internet of Things at very basic level. After completion of this course, they can go for complicated things which are up in the market. Components used in the course are relatively cheaper to comply with the availability.

II. Industry / Employer Expected Outcome

Student will be able to

1. Connect Rasberry Pi & Arduino to computer.
2. Develop sytem or model using different type of sensors.

III. Course Outcomes: Student should be able to

CO1	Establish analog and digital communication between Arduino UNO Raspberry Pi Boards and computer.
CO2	Implement different communication protocols such as UART, I2C, SPI on Arduino UNO and Raspberry Pi Boards for interfacing of different sensors.
CO3	Make clients for specific servers on the Internet using Raspberry Pi Board.

IV.Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	**TLO 1.1.**Configuration of Arduino UNO Board **TLO 1.2.**Establishing connections with a computer	**Introduction to Arduino** 1.1 What is Internet of Things 1.2 Types of Arduino Boards 1.3 Arduino IDE 1.4 Configuration of Arduino UNO Board 1.5 Pin Diagram of Arduino UNO Board 1.6 Establishing connections with a computer **Course Outcome: CO1** **Teaching Hours: 4 hrs**
2	**TLO 2.1.**Demonstrate the use of Sensors **TLO 2.2.**Use of different communication protocol	**Sensors and Communication Protocols** 2.1 Types of Sensors 2.2 UART Communication Protocol 2.3 I2C Communication Protocol 2.4 Ethernet Communication Protocol 2.5 GSM Communication Protocol **Course Outcome: CO2** **Teaching Hours : 12 hrs**
3	**TLO 3.1.**Configuration of Raspberry Pi Board **TLO 3.2.**Establishing connections with a computer .	**Introduction to Raspberry Pi Board** 3.1 Configuration 3.2 I/O Ports 3.3 Pin Diagram of Raspberry Pi Board 3.4 Conventionally used Operating Systems 3.5 Accessing Raspberry Pi from computer via Remote Desktop Connection **Course Outcome: CO1** **Teaching Hours : 4 hrs**
4	**TLO 4.1.**Collection of sensor data to server	**Making Internet of Things** 4.1 Collecting sensor data to a server over internet **Course Outcome: CO3** **Teaching Hours : 10 hrs**

V. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Demonstrate the use of LED	1.1 Blink LED on Arduino UNO Board with half second duration. 1.2 Blink LED on Arduino UNO Board with some complicated timing pattern.	2	CO1
2	**LLO 2.1** Demonstrate the use of UART communication protocol.	2.1 Connect Arduino UNO Board with the computer using UART communication protocol and send a text to computer and verify it on computer. 2.2 Receive a text from computer over same UART connection and echo (retransmit) it to the computer	2	CO2
3	**LLO 3.1** Connection of Arduino Board to Computer.	3.1 Connect a potentiometer to an ADC pin (Analog Read pin) of Arduino UNO Board. 3.2 Connect computer to another UART port of Arduino UNO Board. 3.3 Write a program which will print the voltage level on a new line. Also use loop for repetition.	2	CO2
4	**LLO 4.1**.Demonstrate the use of SONAR distance sensor	4.1 Connect a SONAR distance sensor to Arduino UNO Board 4.2 Connect computer to UART port of Arduino UNO Board. 4.3 Write a program to print the value of distance in centimeters received from the sensor.	2	CO2
5	**LLO 5.1.** Demonstrate the use of Temperature sensor	5.1 Connect a temperature sensor to Arduino UNO Board using I2C communication protocol. 5.2 Connect computer to UART port of Arduino UNO Board. 5.3 Write a program to print the value of temperature received from the sensor.	2	CO2
6	**LLO 6.1.** Demonstrate the use of I2C communication protocol.	6.1 Connect a 3-Axes Accelerometer to Arduino UNO Board using I2C communication protocol. 6.2 Connect computer to UART port of Arduino UNO Board. 6.3 Write a program to print the value of acceleration received from the accelerometer.	4	CO2

7	**LLO 7.1** Connection of GSM module to Arduino UNO Board	7.1 Connect a GSM module to Arduino UNO Board using UART communication protocol. 7.2 Insert your SIM card in the GSM module. Send an SMS to your friend's mobile phone.	4	CO2
8	**LLO 8.1** Perform on Raspberry Pi Board.	Run a Hello World Program in Java on Raspberry Pi Board.	2	CO2
9	**LLO 9.1** Demonstrate the use of DataReceiverServer	Implement DataReceiverServer using Java Servlet and deploy it on a computer.	2	CO2
10	**LLO 10.1** Connect Raspberry Pi Board to computer	Connect Raspberry Pi Board to computer running the DataReceiverServer on Ethernet port.	2	CO3
11	**LLO 11.1** Demonstrate the use of temperature sensor	Connect Raspberry Pi Board to Arduino UNO Board connected to a temperature sensor using UART communication protocol.	2	CO4
12	**LLO 12.1** Sending sensor data to a server over internet	Send data received from the sensor to the DataReceiverServer via Arduino UNO and Raspberry Pi Boards.	2	CO5
13	**LLO 13.1** Demonstrate the use of SONAR distance sensor	Connect a SONAR distance sensor to Raspberry Pi. Display the value of distance in centimeters on the remote desktop.	2	CO5

VI. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Control lights from anywhere using a smartphone app.
2. Monitor and adjust room temperatures for maximum comfort and energy efficiency.
3. Home Intrusion Detection
4. Public Transport Tracking

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators(25 marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (25 marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO- 2	PSO-3
CO1	1	3	3	2	-	3	3	2	3	3
CO2	-	3	3	2	-	3	3	3	3	3
CO3	-	3	3	2	-	3	3	3	3	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr. No.	Author	Title	Publisher
1	Schwartz, Marco.	Internet of things with the Arduino Yún	Packt Publishing Ltd, 2014.
2	Building the Internet of Things	Building the Internet of Things	Wiley

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	http://www.w3schools.com/html	
2	https://www.arduino.cc/	
3	https://www.raspberrypi.org/	

XI.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Ajinkya M. Gadkari	Chief Engineer	Samsung Research Institute (SRIB), Bengaluru, India
2	Prof. Nikhil B. Khandare	Assistant Professor	Department of MCA, VJTI, Mumbai
3	Ms. Jijnasa S. Patil Mrs. Rupali Molawade (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
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering (Sandwich Pattern)												
Course Code: CO23202					**Course Title : Artificial Intelligence**							
Compulsory / Optional: Optional												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
2	**---**	**2**	**2**	**6**	**3**	**---**	**---**	**50**	**25#**	**--**	**25**	**100**

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. The overall research goal of artificial intelligence is to create technology that allows computers and machines to function in an intelligent manner. This course covers fundamentals of AI.

II. Industry / Employer Expected Outcome

Analyse the implications of applying AI systems to organizations and future of work.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CO1	Learn the basic knowledge of AI.
CO2	Demonstrate knowledge of building blocks of AI as presented in terms of intelligent agents.
CO3	Analyze the problem as a state space, graph, design heuristics and select different search techniques to solve them.
CO4	Develop intelligent algorithms and intelligent systems.
CO5	Attain the capability to represent various real life problem domains using logic based techniques.

IV.Course Content Details:

Unit. No	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1.	TLO 1.1 Understand the basic concepts of AI.	**Introduction to Artificial intelligence(AI)** 1.1 Artificial intelligence definition 1.2 Goals of AI 1.3 History of AI 1.4 Applications of AI **Course Outcome: CO1 Teaching Hours :4 hrs**
2.	TLO 2.1 Study AI environments TLO 2.2 Learn the structure and types of AI Agents. TLO 2.3 Understand the need and importance of Agents in AI.	**Agents and Environments** 2.1 Agent terminology 2.2 Structure of intelligent agents 2.3 Types of agents- simple reflex agents, Model based reflex agents, Goal based agents 2.4 Nature of environments, properties of environments 2.5 PEAS representation for an agent **Course Outcome: CO2 Teaching Hours :4 hrs**
3.	TLO 3.1 Learn various Search techniques in AI. TLO 3.2 Implement Search Techniques.	**Search Techniques** 3.1 Heuristic search: Best first search, Hill Climbing 3.2 Beam search, Tabu search 3.3 Finding Optimal Paths: Branch and Bound, Divide and Conquer approaches 3.4 Problem Decomposition: Goal Trees, 3.5 Game playing: Min-max algorithm, AlphaBeta Algorithm, Tic-tac-toe 3.6 Problem solving: Iterative Deepening depth first search (IDDFS) **Course Outcome: CO3 Teaching Hours :8hrs**
4.	TLO 4.1 Learn concepts of Planning used in AI. TLO 4.2 Apply logic theorems in AI.	**Planning and Logic** 4.1. Planning 4.1.1. Introduction to planning 4.1.2. Planning with state space search 4.1.3. Planning and constraint satisfaction: Domains, forward and backward search,goal stack planning, plan space planning, Graphplan, Constraint stack planning, plan space planning, Graphplan, Constraint propagation. 4.2. Logic: 4.2.1. Propositional and First order logic 4.2.2. Forward and backward chaining 4.2.3. Conditional probability, Joint probability, Bayes Theorem, Belief networksand simple inference in

		Belief Networks **Course Outcome: CO3 Teaching Hours :08 hrs**
5.	TLO 5.1 Understand notion of machine learning, deep learning and NLP. TLO 5.2 Correlate machine learning and deep learning. TLO 5.3 Learn use of ML and NLP.	**Applications** 5.1 Introduction to Machine learning 5.2 Introduction to deep learning 5.3 Use of machine learning in deep learning 5.4 Introduction to NLP 5.5 Real life application of ML and NLP **Course Outcome: CO4 Teaching Hours :06 hrs**

V. List of experiments: Total 10 experiments out of 12 experiments should be performed.

Sr No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial	Number of hrs.	Relevant COs
1	LLO 1.1 Identify problem definition for intelligent system. LLO1.2 Design of intelligent system using PEAS	Tutorial exercise for a) Design of intelligent system using PEAS b) Problem definition with state space representation	04	CO1 CO2
2	LLO 2.1 Demonstration of searching algorithms.	Implementation of Beam search algorithm	02	CO2
3		Implementation of Tabu search algorithm	02	CO2
4		Implementation of depth search algorithm	02	CO2
5		Implementation of Min-Max algorithm	02	CO2
6		Implementation of Divide and Conquer algorithm	02	CO2
7		Implementation of Tic-tac-toe algorithm	02	CO3
8		Implementation of AlphaBeta algorithm	04	CO3
9	LLO 3.1 Demonstration of Logic theorem.	Implementation of Bayes' Belief Netwok	04	CO3
10	LLO 4.1 Learn the real life applications of AI.	Case study on AI based humanoid self-driving car	02	All COs
11		Case study on AI in finance sector	02	All COs
12		Case study on AI in medical applications.	02	All COs

VI. References/ Books:

Sr. No.	Book Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Artificial Intelligence: A modern Approach	Stuart Russell and Peter Norvig; Pearson education; 3rd edition; 2015	9789332543515
2	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivshankar B Nair; McGraw Hill; 3rd edition, 2017	9780070087705
3	A first course in Artificial Intelligence	Deepak Khemani; McGraw Hill; 1st edition, 2017	9781259029981
4	A classical approach Artificial Intelligence	M. C. Trivedi; Khanna Publishing House; 2nd edition; 2018	9788190698894

VII. E-References:

1. nptel.ac.in/courses/106106126
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://www.tutorialride.com/artificial-intelligence/artificial-intelligence-tutorial.htm
4. https://www.c-sharpcorner.com/article/a-complete-artificial-intelligence-tutorial/

VIII. CO Vs PO and CO Vs PSO Mapping

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

IX. Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Rahul Kashyap	Analyst National Advisory	Ernst & Young
2	Smt. Vinaya Savdekar	Lecturer in Computer Engineering	Government Polytechnic Jalgaon
3	Smt. N. H. Vachani	Lecturer in Computer Engineering	Govt. Polytechnic Mumbai

Coordinator, Curriculum Development

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell
Government Polytechnic, Mumbai

Principal
Government Polytechnic, Mumbai

Programme : Diploma in Computer Engineering (Sandwich Pattern)													
Course Code: CO23401					**Course Title : Project Seminar I**								
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2.30 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
---	---	02	02	04	02	--	--	--	50	25#	--	25	100

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Project Seminar is the important aspect of any curriculum. Here the students has unlimited scope to integrate his knowledge and skills. This course is essential to understand the recent developments and latest trends in the field. This will help the students to acquire the skill like mining for information, analysis, communication, presentation skills etc. For effective presentation student must have good communication skill. With a given time limit student should be able to express his ideas and concepts, thoroughly in front of faculty members and other students, student should be able satisfy the queries raised by them as well as student should learn to take any feedback positively.

II. Industry / Employer Expected Outcome

Student will be able to

1. Provide opportunities for interdisciplinary work in tackling problems likely to be faced by them in industry which are exciting and challenging.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Collect the information on selected problem identification/Project title.
CO2	Prepare the synopsis on the identified content.
CO3	Make use of internet / book / research paper to assimilate information
CO4	Deliver presentation on selected topic.
CO5	Prepare report on seminar topic.

IV. Course Content Details:

Unit No.	Topics and Sub-topics
1	1.1 Group formation of Students. These are only guidelines; any innovative project ideas related to Computer Engineering may be included. 1. Advanced mobile applications. 2. Artificial intelligence and robotics. 3. Internet of things 4. Networking 5. Animation 6. Big data and data analytics. 7. Machine Learning. 8. Designing software for IT applications. 9. Embedded System. 10. Interfacing of mobile devices with automated devices. 11. Image processing. 12. Biosystems & Computational biology. 13. Cyber security, Ethical Hacking. 14. Cloud Computing Any topic related to recent trends in Computer Engineering
2	**Literature Survey** 2.1. Detailed Survey of any three seminar topics which are a recent trend in the field of Computer Engineering and computing technology. 2.2. Seminar topic should not be a part of any course which student has already studied or will study in final semester of diploma. 2.3 No two groups are allowed to take same topic. Also contents of seminar of no two groups should match more than 30%.
3	**Problem Identification** 3.1 Each group has to make synopsis of three problem definitions selected by students. 3.2 Submit this entire synopsis to the seminar coordinator/mentor/guide. 3.3 Finalize the project topic from seminar coordinator after the confirmation from panel of faculty from dept.
4	**Objectives and Proposed Work** 4.1 Student should gather/collect all information related to final topic either from internet, book or from any research / journal paper. 4.2 Assimilate the information so that student gets to know that how they were applied these concepts into existing technology.

5	**Prepare and Deliver Presentation of Seminar** 5.1 Each student will prepare a seminar presentation in the term making use of audio/visual aids for duration of 10-15 minutes and deliver it on the assigned date only. Each group is required to give presentation independently. 5.2 All students must attend seminars and it is expected that they should listen it carefully and take part in questioning actively. 5.3 A panel of faculty members along with guide will assess the seminar internally during the presentation. Faculty members should ask questions.
6	**Preparing Seminar Report** 6.1 Each student should prepare seminar report containing at least 25 pages as per the format prescribed by department. Student should submit the seminar report in the form of spiral bound journal duly signed by the Guide, Head of Department and Principal.

V. Seminar Report Format

1. Seminar report shall be in the print form on A-4 size white bond paper.
2. Typing shall be in Times New Roman with spacing of 1.5 using one side of paper.
3. Margins: Left = 37.5 mm Right, Top and Bottom = 25mm.
4. Front page: Titles - TNR 18 bold, other – TNR 14 bold. With Institute Logo.
5. Inner Pages: Titles –TNR – 14 Bold, other TNR 12.
6. Page Nos: Should appear on the right hand top corner of each page starting after index page.
7. Tables to be preferable in the Text format only.
8. Sketches to be drawn on separate sheet / pages in black ink.
9. The Last content in the index to be of references. Acknowledgement to be added in report.
10. Binding: Spiral binding is preferred for the seminar report. The number of copies are to be prepared by the student are 3 nos. (Student + Guide + Department copy)
11. Front page should contain following format
    Project title
    Student names & roll no (Group wise)
    Name of Project guide
    Department

Second page onwards must contain following format

12. Abstract
13. Introduction
14. Existing system problems
15. Requirement specification
16. Hardware requirements
17. Software requirements
18. Control flow diagram/ block diagram
19. References

VI. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning) and Summative Assessment

Rubrics for continuous assessment based on process and product related performance indicators (50 marks)

Rubrics for End term examination, Viva-voce, Workshop performance (50 marks)

Cr.No	Rubric Criterion	Max marks
1	Problem Identification	10
2	Literature Review	10
3	Project Proposal	10
4	Final Report Preparation	10
5	Presentation and Defence	10

VII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	--	3	--	3	--	--	--	--	2	3
CO2	--	1	--	---	--	--	--	--	2	3
CO3	---	--	3	3	---	---	--	1	--	3
CO4	--	2	3	--	--	--	---	2	2	3
CO5	--	3	--	--	--	--	--	2	2	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

VIII. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	**http://www.seminarsonly.com/**	-
2	**http://a4academics.com/be-seminar-topics**	
3	**http://www.collegelib.com/t-71-topics-for-computer-engineering-and-cse-technology-seminars-listed-latest-topics.html**	
4	**http://www.seminarstopics.com/branch/latest-seminar-topics-for-cse-2017**	

IX. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Kumar Patil	Consultant	ATOS Global IT Solutions and Servies Pvt. Ltd. Airoli, Navi Mumbai
2	Mrs. V. B. Savadekar	Lecturer in Computer Engineering	Government Polytechnic, Jalagaon
3	Dr. R. M. Komatwar	Lecturer in Computer Engineering	Government Polytechnic, Mumbai

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