



Government Polytechnic Mumbai

(Academically Autonomous Institute of Maharashtra Government)

49, Ali Yawar Jung Marg, Kherwadi, Bandra (E)

gpmumbai@gpmumbai.ac.in

Programme: Information Technology

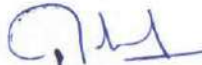
Fourth Semester


With effect from June 2017

Course Code	Course Title	Teaching Hours				Credits	Examination Scheme					
		L	P	TU	Total		Theory		PR	OR	TW	Total
							TH	TS				
IT16305	Data Structure and Applications	3	2	----	5	5	70	30	50*	---	---	150
CO16205	Microprocessor	3	2	----	5	5	70	30	50	---	---	150
IT16306	Computer Networking	3	2	---	5	5	70	30	---	25*	---	125
CO16307	Java Programming	3	4	---	7	7	70 #	30	50*	---	---	150
IT16307	Multimedia Techniques	1	4	----	5	5	---	---	50*	---	25	75
IT16308	Operating System	3	2	---	5	5	70	30	50*	---	---	150
MG16502	Entrepreneurship Development	1	---	2	3	3	---	---	---	25*	25	50
	TOTAL	17	16	2	35	35	350	150	250	50	50	850

Abbreviations: L- Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work.

* Indicates assessment by External Examiner # Indicates Online Examination


Academic Coordinator
(Dr. R.A. Pahl)

Approved Copy

Academic Co-ordinator
G. P. Mumbai


Head of Department
(Information Technology)


Principal
Government Polytechnic Mumbai

Programme : Diploma in IT / CO									
Course Code: IT 16 305				Course Title: Data Structures and Applications					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	-	02	05	70 (3 hrs)	30	50*	-	-	150

*Assessment by External Examiner

Rationale:

Data structure is a subject of primary importance in Information Technology. Organizing or structuring data is important for implementation of efficient algorithms and program development. Efficient problem solving needs the application of appropriate data structure during program development. The practice and assimilation of data structure techniques is essential for programming. The course will help students to develop the capability of selecting a particular data structure.

Course Outcomes:

Student should be able to

CO1	Identify major algorithms and data structures.
CO2	Analyze performance of algorithms.
CO3	Choose the appropriate data structure and algorithm design method for a specified application.
CO4	Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
CO5	Illustrate various searching & sorting algorithms.
CO6	Apply recursive methods.

Course Content Details:

Unit No	Topics / Sub-topics
I	Introduction to Data Structures 1.1 Definition : Data Structures & Abstract Data Types 1.2 Classification of Data structures : Linear, Nonlinear, homogeneous, non-homogeneous, static & dynamic. 1.3 Arrays : Definition & types of array, Memory representation of one & two dimensional array, Application of arrays. 1.4 Operations on Arrays : Insertion, Deletion, Traversal 1.5 Algorithm : The role of an algorithm in computing, analyzing algorithms, Designing



	<p>algorithms.</p> <p>1.6 Time and Space Complexity</p> <p>1.7 Big-Oh Notation</p>
2	<p>Searching & Sorting</p> <p>2.1 Searching</p> <p>2.1.1 Linear Search</p> <p>2.1.2 Binary Search</p> <p>2.1.3 Hash Search</p> <p>2.2 Sorting</p> <p>2.2.1 Bubble Sort</p> <p>2.2.2 Insertion sort</p> <p>2.2.3 Selection sort</p> <p>2.2.4 Merge sort</p> <p>2.2.5 Radix sort</p> <p>2.2.6 Heap sort</p>
3	<p>Stacks</p> <p>3.1 Definitions & examples of stack</p> <p>3.2 Primitive operations : Push, Pop</p> <p>3.3 Overflow & underflow of stack.</p> <p>3.4 Representation of stack using array</p> <p>3.5 Stacks using Dynamic Arrays or linked list</p> <p>3.6 Applications of stack. : Expression Evaluation and Conversion, Polish notation and expression conversion, Reverse String.</p> <p>3.7 Recursion</p> <p>3.7.1 Definition and Concept</p> <p>3.7.2 Types of Recursion</p> <p>3.7.3 Recursion versus Iteration</p> <p>3.7.4 Examples: Factorial, GCD, Fibonacci sequence, Tower of Hanoi</p>
4	<p>Queues</p> <p>4.1 Definitions & examples of Queues</p> <p>4.2 Concept of Queues : Front, Rear ,FIFO</p> <p>4.3 Primitive Operations: Searching, Insertion, Deletion.</p> <p>4.4 Overflow & underflow of Queue.</p> <p>4.5 Types of Queue: Circular queue, Priority queue, Dequeues</p> <p>4.6 Representation Of Queue using Array</p> <p>4.7 Circular queues using Dynamic arrays or linked list</p>
5	<p>Linked List</p> <p>5.1 Introduction and Terminologies</p> <p>5.1.1 Node</p> <p>5.1.2 Next Address and Pointer</p> <p>5.1.3 Null pointer, Empty list</p> <p>5.1.4 Linked List Versus Array</p> <p>5.2 Types of lists</p> <p>5.2.1 Single Linked list</p> <p>5.2.2 double linked list</p> <p>5.2.3 Circular list</p>



	5.3 Operations on linked list 5.3.1 Searching 5.3.2 Insertion 5.3.3 Deletion 5.4 Applications of Linked lists – Polynomials, Sparse matrix representation.
6	Trees & Graphs 6.1 Introduction and Terminologies 6.1.1 Sub-tree 6.1.2 root, leaf, left, right 6.1.3 parent, child, siblings 6.1.4 ancestor, descendant 6.1.5 level, depth 6.2 Type of tree 6.2.1 Binary tree 6.2.2 Binary Search tree 6.2.3 Expression tree 6.2.4 Height balanced tree 6.2.5 Weight balanced tree 6.3 Operations on trees 6.3.1 Insertion 6.3.2 Deletion 6.3.3 Searching 6.3.3.1 Depth-first search 6.3.3.2 Breadth-first search 6.4 Traversing 6.4.1 Pre-order 6.4.2 In-order 6.4.3 Post-order 6.5 Application of Trees -Evaluation of Expression 6.6 Graphs 6.6.1 Introduction and terminology

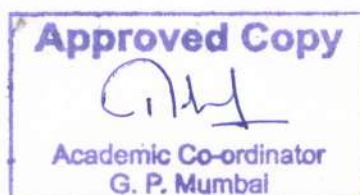
Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Data Structures	06	4	4	2	10
2	Searching & Sorting	10	2	4	8	14
3	Stacks	07	4	4	4	12
4	Queues	06	2	4	4	10
5	Linked List	08	-	4	8	12
6	Trees & Graphs	08	4	4	4	12
Total		45	16	24	30	70



List of experiments/Assignments:

Sr. No	Unit	List of Experiments	Approx Hours
01	1	Program using Arrays : a) Write a program to insert an element b) Write a program to delete an element	02
02	2	Program using Searching: Write C program to store roll numbers of student in array who attended training program in random order. Write function for- a) Searching whether particular student attended training program or not using linear search and binary search.	02
03	2	Program using Sorting: a) Write C program to store first year percentage of students in array. Write function for sorting array of floating point numbers in ascending order using Bubble sort and display top five scores. b) Write C program to store second year percentage of students in array. Write function for sorting array of floating point numbers in ascending order using Insertion sort c) Write C program to store X th percentage of students in array. Sort array of floating point numbers in ascending order using radix sort and display top five scores. d) Write C Program using Selection Sort. Merge Sort.	06
04	3	Program using Stack : a) Write a program to PUSH and POP an element. Write C program with functions- a) To check whether given string is palindrome or not that uses a stack to determine whether a string is a palindrome.(Using Reverse String concept)	02
05	3	Program on Recursion: a) Write a program to display Fibonacci series. b) Write a program to find Factorial of given number.	02
06	4	Program using Queue: a) Write a program to insert an element. b) Write a program to delete an element.	02
07	5	Program using Single / Double Linked List : Insertion & Deletion (Hint : Use Switch case) a) At the Beginning b) At the End c) Before the node d) After the node	04
08		Program using Circular Linked List(Single & Double): Insertion &	04



	5	Deletion (Hint : Use Switch case) a) At the Beginning b) At the End c) Before the node d) After the node	
09	6	Program for demonstration of Tree Operations :- Create, Insert, In-order, Pre-order, Post-order Traversal	02
10		Mini Project(Any One) A) Develop a Supermarket Billing System using C. The key features of this application are listed below : 1. Bill Report: It shows the bill report of all the items added in supermarket billing system. 2. Add, Remove or Edit items: With this feature one can add, remove and modify item details. In add items, one can add information or details such as item no., item name, manufacturing date, price, quantity, tax percent, and many more. 3. Show item details: This feature allows users to see the items and the corresponding details given for the item while adding the item. Use file to store the data. B) Design and develop the Tic-Tac-Toe Game using C.	04
Total			30



References/ Books:

Sr. No.	Book Title	Author	Publication
1	Data Structures using C	Reema Thareja	Oxford
2	Data Structures Through C	Yashawant Kanetkar	BPB Publications
3	Handbook of DATA STRUCTURES and APPLICATIONS	Dinesh P. Mehta and Sartaj Sahni	CHAPMAN & HALL/CRC


Course Curriculum Development Committee:**a. Internal Faculty**

Ms. Usha C. Khake (Lecturer, Computer Engineering, Govt. Polytechnic Mumbai)

Ms. Pooja Chame (Lecturer, Computer Engineering, Govt. Polytechnic Mumbai)

b. External Faculty

Mr. R. G. Suryawanshi (Proprietor, Surya InfoEdge)


Academic Coordinator
(R. A. Patil)


Head of Department
(Information Technology)


Principal
Govt. Polytechnic/Mumbai



Course Name:- Data Structures and Applications

Course Code:-IT16305

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2							2
CO2	2	3	2	1						2
CO3	1	3	3	2	1					3
CO4	1	3	3	2						3
CO5		3	3	2	1					3
CO6		3	2	2						2

CO Vs PSO matrix

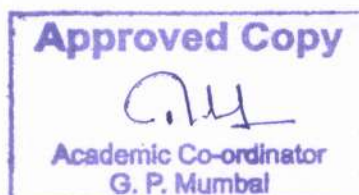
CO/PSOs		PSO1	PSO2	PSO3
CO1	Identify major algorithms and data structures.		2	2
CO2	Analyze performance of algorithms.		2	3
CO3	Choose the appropriate data structure and algorithm design method for a specified application.	2	3	2
CO4	Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs		3	1
CO5	Illustrate various searching & sorting algorithms.	1	3	1
CO6	Apply recursive methods.		2	

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
01	01	Introduction to Data Structures	CO1: Identify major algorithms and data structures. CO2: Analyze performance of algorithms. CO3: Choose the appropriate data structure and algorithm design method for a specified application.
02	02	Searching & Sorting	CO2: Analyze performance of algorithms. CO5: Illustrate various searching & sorting algorithms.
03	03	Stacks	CO4: Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs CO6: Apply recursive methods.
04	04	Queues	CO4: Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs



05	05	Linked List	CO4: Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
06	06	Trees & Graphs	CO4: Understand the abstract properties of various data structures such as stacks, queues, lists, trees and graphs



Programme : Diploma in CO / IT									
Course Code: CO16205				Course Title: Microprocessor					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70 (3 Hrs.)	30	50			150

Rationale:

Many people throughout the world use laptops, microcomputers, smart phones, digital assistant devices etc. All of these devices utilize a key component: a microprocessor. Microprocessor is brain of all these systems. This course covers architecture, signal descriptions and functioning of the microprocessor. It also covers interfacing of memories and input-output devices with microprocessor. It also covers assembly language programming and at the end student will learn to design various microprocessor based systems. Architecture of 32 bit processors, Pentium processors and latest i7 processor is also introduced in the subject.

Course Outcomes:

After the completion of the course student will be able to

CO1	Explain architecture and describe the pin configuration of 8086 microprocessor.
CO2	Describe and explain the instructions of 8086
CO3	Develop assembly language programs for 8086
CO4	Draw timing diagrams for various instructions
CO5	Interface various memories and I/O devices to 8086 with assembly language programs for interfacing
CO6	Explain architecture of advanced processors.

Course Content Details:

Unit No	Topics / Subtopics
1	INTRODUCTION: 1.1 Introduction to single board microcomputer Block diagram of microcomputer Elements of microcomputer Different type of Buses: Address, data and control bus 1.2 Evolution of microprocessor 1.3 Limitations of 8 bit microprocessor



2	MICROPROCESSOR 8086: 2.1 Features/Specifications of microprocessor 8086 2.2 Architecture of 8086 2.3 Register organization of 8086, concept of pipelining 2.4 Memory Segmentation, 20 bit physical address generation 2.5 Pin configuration and signal description of 8086 2.6 Minimum mode of 8086, address/data demultiplexing 2.7 Maximum mode of 8086
3	INSTRUCTION SET OF 8086: 3.1 Machine language instruction format 3.2 Addressing modes of 8086 3.3 Instruction set of 8086 3.3.1 Data transfer instructions 3.3.2 Arithmetic and logical instructions 3.3.3 Control transfer or branching instructions 3.3.4 String manipulation instructions 3.3.5 Processor control instructions 3.3.6 Bit manipulation instructions 3.3.7 Iteration control instructions 3.4 Assembler Directives
4	ASSEMBLY LANGUAGE PROGRAMMING OF 8086: 4.1 Assembler Elements of assembly language programming, Overview of assembly process, Single Pass assembler, Two pass assembler 4.2 Linker and loader 4.3 Opcode (machine code) generation 4.4 Assembly language programming of 8086 4.5 Concept of Procedure and Macros, Reentrant and Recursive procedure
5	TIMING DIAGRAMS AND INTERRUPTS 5.1 Memory read and memory write timing diagram in Minimum mode 5.2 Memory read and memory write timing diagram in Maximum mode 5.3 Interrupts and Interrupt service routines
6	MEMORY AND I/O INTERFACING 6.1 Interfacing techniques: Memory mapped I/O, I/O mapped I/O 6.2 Address generation and decoding techniques 6.3 Interfacing of memories (RAM, ROM, EPROM) 6.4 Interfacing of I/O devices LEDs, Seven segment display, ADC, DAC, Stepper motor.
7	ADVANCED PROCESSORS 7.1 80486 (32 bit) microprocessor Salient features, Internal architecture, Register organization 7.2 Pentium Processor Salient features, Internal architecture 7.3 i7 Processor Salient features, Internal architecture



Suggested Specifications Table with Hours and Marks (Theory):

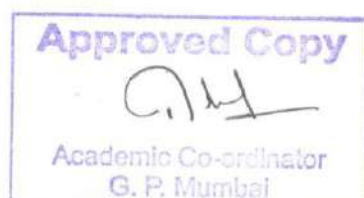
Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	INTRODUCTION	02	02	02		04
2	MICROPROCESSOR 8086	10	06	08		14
3	INSTRUCTION SET OF 8086	06	02	06		08
4	ASSEMBLY LANGUAGE PROGRAMMING OF 8086	10			16	16
5	TIMING DIAGRAMS AND INTERRUPTS	04		04	04	08
6	MEMORY AND I/O INTERFACING	08			12	12
7	ADVANCED PROCESSORS	05	04	04		08
Total		45	14	24	32	70

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

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

List of Practicals :- Any Ten

1	Understand 8086 development board and simulation software
2	8086 Assembly language programming for Addition and subtraction of two 16 bit numbers
3	8086 Assembly language programming for Addition of series of 16 bit numbers
4	8086 Assembly language programming for multi byte addition of two numbers
5	8086 Assembly language programming for multiplication of two 16 bit signed and unsigned numbers
6	8086 Assembly language programming for division of two 16 bit signed and unsigned numbers
7	8086 Assembly language programming for arranging 16 bit numbers in ascending order.
8	8086 Assembly language programming for arranging 16 bit numbers in descending order.
9	8086 Assembly language programming for block transfer of 16 bit data.
10	Interface LEDs to 8086 and develop, simulate an assembly language program to



	get effect of dancing light.
11	Interface seven segment display to 8086 and develop, simulate an assembly language program to display numbers from 1 to 9 on it.
12	Interface stepper motor to 8086 and develop program to rotate motor in clockwise direction.
13	Develop and simulate assembly language program for Traffic controller.

Reference Books:

Sr. No.	Book Title	Author	Publication
1	Advanced Microprocessor and Interfacing	Badri Ram	McGraw Hill
2	8086 Microprocessor: Programming and Interfacing the PC	Kenneth Ayala	West Pub
2	Advanced Microprocessor and Peripherals	A. K. Ray, K. M. Bhurchandi	McGraw Hill
3	Microprocessor & interfacing (Programming & Hardware)	Douglas Hall	McGraw Hill

Course Curriculum Development Committee:**a. Internal Faculty**


Dr. R. A. Patil (Sel. Grade Lecturer, Electronics Engineering, Govt. Polytechnic Mumbai)


Ms. S. R. Nagargoje (Lecturer, Electronics Engineering, Govt. Polytechnic Mumbai)

Mr. N. R. Kitke (Visiting Faculty, Computer Engineering, Govt. Polytechnic Mumbai)

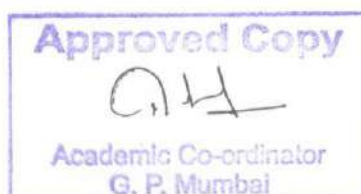
b. External Faculty

Dr. Uday Khot (Lecturer, Electronics Engineering, St. Francis Institute of technology, Mumbai)


Academic Coordinator
 (Dr. R. A. Patil)


Head of Department
 (Computer engineering)


Principal
 Govt. Polytechnic Mumbai



Information Technology Department

Programme : Diploma in Information Technology									
Course Code: IT16306				Course Title: Computer Networking					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70(3 Hrs)	30	--	25*	---	125

*Assessment by External Examiner

*Assessment by External Examiner

Rationale:

Now days, every organization, industry or the service sector own their private computer networks. A Computer networks has been growing with rapid technological progress. Computer communication through networking becomes essential part of our life. This course provides students with conceptual understanding of basics of computer networks.

Course Outcomes:

Student should be able to:

CO1	Identify computer network on the basis of various network parameter.
CO2	Describe OSI-ISO and TCP/IP computer network models.
CO3	Analyze working of different networking devices.
CO4	Classify IP addresses and assigning addresses to the network component.
CO5	Demonstrate working of different networking protocols.
CO6	Select the most appropriate networking architecture and technologies to given organization.

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction <p>1.1 Concept of Network : Human Networks, Computer Networks</p> <p>1.2 Benefits of Network: Sharing Information, Sharing Resources</p> <p>1.3 Network classifications : PAN, LAN, MAN, WAN, GAN, VPN</p>

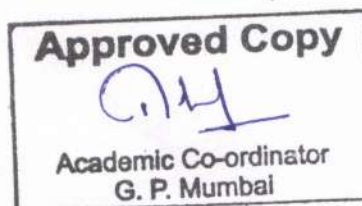
	<p>1.4 Interconnection of Network : Internetwork</p> <p>1.5 Network Topologies : BUS, RING, STAR, TREE, MESH, HYBRID</p> <p>1.6 Network Services : File Sharing, Printer Sharing, Application Services, E—Mail, Remote Access</p>
2	<p>The OSI Model and TCP/IP Protocol Suite</p> <p>2.1 Protocols and Standards: Protocols, Standards and Organizations, Internet Standards, Protocol layers</p> <p>2.2 The OSI model : Layered Architecture, Layer-to-Layer Communication, Encapsulation, Layers in the OSI Model</p> <p>2.3 TCP/IP Protocol Suite : Comparison between OSI and TCP/IP Protocol Suite, Layers in the TCP/IP Protocol Suite</p> <p>2.4 Addressing: Physical Addresses, Logical Addresses, Port Addresses, Application-Specific Addresses</p>
3	<p>Underlying Technologies</p> <p>3.1 Wired Local Area Networks: IEEE Standards, Frame Format, Addressing ,Ethernet Evolution(Introduction to Standard Ethernet, Fast Ethernet, Giga Ethernet, Ten-Giga Ethernet)</p> <p>3.2 Wireless LANS : IEEE 802.11, MAC Sublayer, Addressing Mechanism</p> <p>3.3 Introduction to point to point WANS and Switched WANS</p> <p>3.4 Connecting Devices: Hub , Repeaters, Bridges ,Switches, Routers, Gateway</p>
4	<p>Network Layer – Addressing</p> <p>4.1 Introduction To IPV4 Address :- Address Space, Notation</p> <p>4.2 Classful Addressing : Classes and Blocks, Two-Level Addressing, Three-Level Addressing: Subnetting, Supernetting</p> <p>4.3 Classless Addressing : Variable-Length Blocks, Two-Level Addressing, Block Allocation, Subnetting</p> <p>4.4 Special Addresses: Special Blocks, Special Addresses in Each block</p> <p>4.5 Introduction to IPV6, Comparison of IPV4 & IPV6</p>



5	Network & Transport Layer Protocols 5.1 Unicast Protocols: RIP, OSPF, BGP 5.2 Multicast Routing Protocols: ICMP, IGMP, DHCP 5.3 Transport Layer Services 5.4 UDP: User Datagram, UDP Services 5.5 TCP: TCP Services, TCP Features, Segment, A TCP Connection
6	Applications 6.1 Simple mail transfer protocol(SMTP) 6.2 Domain Name System(DNS) 6.3 Simple Network Management Protocol(SNMP) 6.4 Hyper Text Transfer Protocol(HTTTP) 6.5 Uniform Resource Locator(URL) 6.6 Remote Login: TELNET and SSH 6.7 Multipurpose Internet Mail Extension(MIME) 6.8 File Transfer Protocol(FTP),TFTP

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	6	4	4	2	10
2	The OSI Model and TCP/IP Protocol Suite	6	2	6	2	10
3	Underlying Technologies	8	2	4	6	12
4	Network Layer – Addressing	8	2	4	6	12
5	Network & Transport Layer Protocols	10	4	6	4	14
6	Applications	7	4	4	4	12
Total		45	18	28	24	70

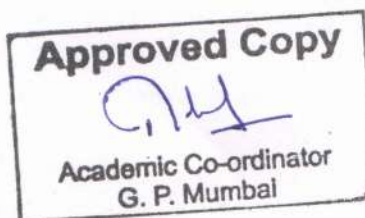


Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

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

List of experiments/Assignments: (Minimum 10 experiments should be performed.)

Sr. No.	Unit	List of Experiments	Approx. Hours
1	1	Sharing of different devices in network	2
2	1	Identify network Topology used in your department laboratory. Draw its layout.	2
3	3	Observe Components of Network in your departmental Laboratories. Draw layout of departmental Laboratory.	2
4	4	Make a list of the network components and resources used in GP MUMBAI Institute Campus wide network. Draw the network design using networking software tool.	2
5	4	Crimping of RJ-45 according to desired standards and formation of cross cable and direct cable.	2
6	4	Study of Subnet Masking and create two subnets in given laboratory.	2
7	5	Use Wireshark or tcpdump Interface for inspecting traffic at the Data Link Layer, network, transport layer and application layer.	2
8	5	Implementation of network commands. (ipconfig, tracert, ping, telnet etc.)	2
9	5	Implementing a TCP/IP Network configuration.	2
10	6	Demonstration of DHCP Protocol.	2
11	6	Demonstration of DNS Protocol using teamviwer.	2
12	6	Demonstration of TELNET Protocol using teamviwer.	2
13	6	Set up peer to peer computer network.	2
14	6	Demonstration of FTP Client –server model using any ftp demo websites (Example: Wing FTP Server).	2
15	1 to 6	Visit server room of institute and prepare case study on 1. Proxy Server 2. Server Configuration 3. Router Configuration 4. Firewall Configuration 5. Network setup details (Topology, Back up, IP range, Network software)	2
Total			30



References/ Books:

Sr. No.	Book Title	Author	Publication
1	TCP/IP Protocol Suite	Behrouz A. Forouzan	Tata McGraw Hill
2	Data Communications and Networking	Behrouz A. Forouzan	Tata McGraw Hill
3	Computer Networks	Andrew S. Tanenbaum	PHI Publications
4	Data Communications and Networks	Achyut S. Godbole	Tata McGraw Hill
5	Complete Reference Networking	Craig Zacker	Tata McGraw Hill

- <http://nptel.ac.in/courses/106105081/1>
- <http://www.nptelvideos.in/2012/11/computer-networks.html>
- https://www.tutorialspoint.com/data_communication_computer_network/
- <https://www.slideshare.net/vasanthimuniasamy/computer-networking-27374479>


Course Curriculum Development Committee:**a. Internal Faculty**

Ms. M. S. Arade (Lecturer in Information Technology, Govt. Polytechnic Mumbai)
 Ms. N. A. Wankhade (Lecturer in Information Technology, Govt. Polytechnic Mumbai)

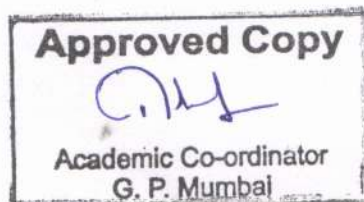
b. External Faculty

Ms. Rekha Kalambe (Lecturer in Information Tech, Govt. Polytechnic Nashik)
 Ms. Pratibha Zunjare (Senior Project Manager, Wipro Technologies, Washington D.C)


 Academic Coordinator


 Head of Department
 Information Technology


 Principal
 Govt. Polytechnic Mumbai



Programme : Diploma in Computer Engineering/Information Technology									
Course Code: CO16307				Course Title: Java Programming					
Compulsory / Optional: Compulsory.									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	--	04	07	70#	30	50*	--	--	150
# Indicates Online Theory Exam				* Assessed By: External Examination					

Indicates Online Theory Exam.

* Assessed By External Examiner.

Rationale:

After having sufficient command on structured and object oriented programming, Computer Engineering students must learn the Java Programming language. Although Java language was developed two decades back, it occupies maximum share of technology in the market due to its continuous and adaptive evolution in the form of versions. Students should learn higher level programming using Java and make the use of latest features init, for better quality of software and betterment of the society in turn. In this course, emphasis is given on features of Java which have been and about to be stable for long time in the market such as Exception Handling, Collection Framework, Generics and Javadocs Creation, etc.

Course Outcomes:

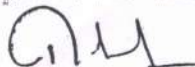
Students will be able to

CO 1	Explain the Basic building blocks of a Java Program.
CO 2	Describe Object Oriented Features of Java Language.
CO 3	Explain the terms like Assignments, Garbage Collection and Operators in Java.
CO 4	Predict the flow of execution of Java programs using constructs, loops and exceptions.
CO 5	Develop a Java Application using I/O, Generics and Collection.
CO 6	Use Inner classes in Java Application Development.

Course Contents:

Unit No.	Contents
1.	Declarations and Access Control <ul style="list-style-type: none"> 1.1 Identifiers & Keywords 1.2 Defining Classes <ul style="list-style-type: none"> 1.2.1 Source File Declaration Rules 1.2.2 Using the javac and java Commands 1.2.3 Using public static void main(String[] args) 1.2.4 Import Statements and the Java API 1.2.5 User Defined Packages 1.2.6 Static Import Statements 1.2.7 Class Declarations and Modifiers 1.3 Declaring Interfaces and interface constants 1.4 Declaring Class Members <ul style="list-style-type: none"> 1.4.1 Access Modifiers 1.4.2 Non-access Member Modifiers 1.4.3 Constructor Declarations 1.4.4 Variable Declarations 1.4.5 Declaring Enums 1.5 Java Version History 1.6 Creating First Java Application using IDE 1.7 Introduction to Javadocs 1.8 Creating javadocs for your own classes with the help of IDE
2.	Object Orientation <ul style="list-style-type: none"> 2.1 Encapsulation (Setters and Getters) 2.2 Inheritance and Polymorphism, Is-A, Has-A 2.3 Overriding / Overloading methods 2.4 Reference Variable Casting 2.5 Implementing an Interface 2.6 Legal Return Types 2.7 Constructors and Instantiation 2.8 Static Variables and Methods
3.	Assignments, Operators, Strings and Arrays <ul style="list-style-type: none"> 3.1 Use of Stack and Heap during Program Execution 3.2 Literals, Assignments, and Variables 3.3 Scope of Variables 3.4 Variable Initialization 3.5 Using Wrapper Classes and Boxing 3.6 Garbage Collection 3.7 Java Operators 3.8 Using String, StringBuilder, and StringBuffer classes and their methods

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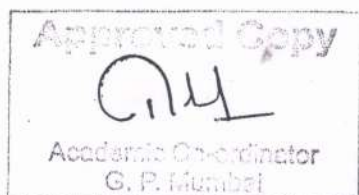
- 3.9 Using Arrays
- 3.10 Arrays of Objects
- 3.11 Using ArrayList

4. Flow Control, Exceptions, and Assertions

- 4.1 Loop Constructs
 - 4.1.1 Enhanced for loop
 - 4.1.2 Using break and continue
 - 4.1.3 Unlabeled Statements
 - 4.1.4 Labeled Statements
- 4.2 Handling Exceptions
 - 4.2.1 Catching an Exception Using try and catch
 - 4.2.2 Using finally
 - 4.2.3 Propagating Uncaught Exceptions
 - 4.2.4 Defining Exceptions
 - 4.2.5 Exception Hierarchy
 - 4.2.6 Handling an Entire Class Hierarchy of Exceptions
 - 4.2.7 Exception Matching
 - 4.2.8 Exception Declaration and the Public Interface
 - 4.2.9 Rethrowing the Same Exception
- 4.3 Common Exceptions and Errors
 - 4.3.1 Where Exceptions Come From
 - 4.3.2 JVM Thrown Exceptions
 - 4.3.3 Programmatically Thrown Exceptions
- 4.4 Multithreading
 - 4.4.1 Thread Life Cycle
 - 4.4.2 Extending Thread class
 - 4.4.3 Implementing Runnable Interface
- 4.5 Overview of with the Assertion Mechanism

5. I/O, Formatting, and Parsing

- 5.1 IO Streams and Console IO
- 5.2 File Navigation and I/O
 - 5.2.1 Creating Files Using the File Class
 - 5.2.2 Using FileWriter and FileReader
 - 5.2.3 Combining I/O Classes
 - 5.2.4 Working with Files and Directories
 - 5.2.5 The java.io.Console Class
- 5.3 Files, Path, and Paths
 - 5.3.1 Creating a Path
 - 5.3.2 Creating Files and Directories
 - 5.3.3 Copying, Moving, and Deleting Files
 - 5.3.4 Retrieving Information about a Path
 - 5.3.5 Normalizing a Path
 - 5.3.6 Resolving a Path



	5.3.7 Relativizing a Path 5.4 Working with Dates, Numbers, and Currencies and Locale(Java 8 specific) 5.5 Parsing 5.6 Tokenizing 5.7 Formatting
6.	Overview of Generics and Collections 6.1 toString(), hashCode() and equals() methods 6.2 Collections 6.3 Using the Collections Framework 6.4 Generic Types
7.	Inner Classes and Other topics 7.1 Nested Classes and Inner Classes 7.2 Method-Local Inner Classes 7.3 Anonymous Inner Classes 7.4 A brief introduction to Lambda Expressions 7.5 Default Methods, Multiple Defaults, Static Methods on Interfaces 7.6 Classpath, Creating JAR Files and Executable JARs

Suggested Specifications Table with Hours and Marks (Theory):

Unit No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Declarations and Access Control	5	2	2	4	8
2.	Object Orientation	6	2	4	4	10
3.	Assignments, Operators, Strings and Arrays	6	2	4	4	10
4.	Flow Control, Exceptions, and Assertions	8	2	4	6	12
5.	I/O, Formatting, and Parsing	8	4	4	4	12
6.	Overview of Generics and Collections	7	2	4	4	10
7.	Inner Classes and Other topics	5	2	2	4	8
Total		45	16	24	30	70

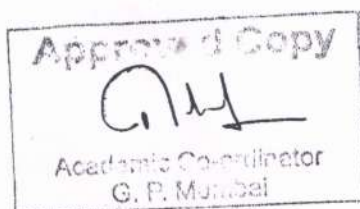
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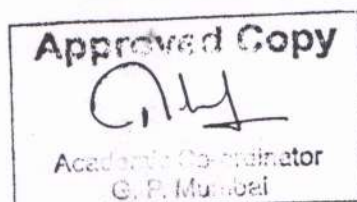
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List of Experiments:

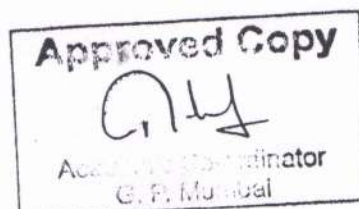
Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1.	1	Getting started with Java Application Development using IDE 1.1 Check whether latest version of java (JDK 9 or at least JDK 1.8) is installed or not. If not then download and install it. 1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans IDE 8.1/ Eclipse Neon or later version of IDE 1.3 Create a Java Project/ Application in the IDE 1.4 Create a Java class Person containing two variables name and yearOfBirth of appropriate data types, take inputs from the command line argument. Display the name and age of the person. 1.5 Save the project and run it. 1.6 Explore all the features (the menu) of the IDE. Learn about their use.	2
2.	1	2.1 Think-Pair-Share Think (15 mins) Enlist maximum known keyboard and mouse shortcuts in the IDE. e.g. insert code (inserting constructors, setter, getters, etc.), shortcuts for run, Refactor, breakpoint, etc. Pair (20 mins) Share your list of shortcuts to your partner and discuss what is being missed out. Update your list accordingly if required. Share (25 mins) Share your list with your batch mates and the faculty. Get it verified with the faculty. Prepare a consolidated list for entire batch and share it within the batch. 2.2 Define the following classes/ interfaces with the help of above shortcuts(60 mins): 1. Person(id, name, dateOfBirth, age, street, city, pin : default and parameterized constructors and setters and getters) 2. Department(id, name, dateOfEstablishment, headOfficeLocation, headId, numberOfEmployees : default and parameterized constructors and setters and getters) 3. Point(x, y, z : default and parameterized constructors and setters and getters) 4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numberOfWheels, vehicleType, model, numberOfSeats : default and parameterized constructors and setters and getters) 5. Laptop(imeiNumber, processorName, processorSpeed, primaryMemoryType, primaryMemoryCapacity, secondaryStorageType, secondaryStorageCapacity, screenResolution, screenType, isLED, listOfPorts, osInstalled : default and parameterized constructors and setters and getters) 6. interface Taxable(public int cost(), public int percentGST())	2



3.	1	<p>Team-Pair-Solo with Javadocs (To be completed in a single lab session) Given: Open education resources like videos, etc. for Javadocs Creation by the faculty one week in advance.</p> <p>Team (35 mins)</p> <ol style="list-style-type: none"> 1. Make groups of 4 students from the batch. 2. Write down the definitions for any two of the five classes given in 2.2 in IDE with documentation comments: 3. Generate the javadoc for any two classes. 4. Share your work with other teams and get their feedback. 5. Modify the javadoc(s) accordingly if required. <p>Pair (35 mins)</p> <ol style="list-style-type: none"> 1. Repeat the activity in pairs for any two of the remaining classes. 2. Share your work with other pair in your team and get their feedback. 3. Modify the javadoc(s) accordingly if required. <p>Solo (30 mins)</p> <ol style="list-style-type: none"> 1. Repeat the same activity individually. 2. Share your work with other peer in your pair and get his/her feedback. 3. Modify the javadoc(s) accordingly if required. <p>Consolidate a final javadocs specification for the classes which is agreed unanimously by the students and the faculty. (20 mins)</p>	2
4.	2	<p>4.1 Check whether feature of Encapsulation has been followed in the classes in 2.2. If not make necessary changes in the classes.</p> <p>4.2 Define classes Car, Train and Truck with necessary attributes, constructors and methods. Implement IS-A relationship with the Class Vehicle.</p> <p>4.3 Define a class Gadget with necessary attributes, constructors and methods. Modify the class Laptop to extend the class Gadget.</p> <p>4.4 Create a subclass Employee of the class Person. HOD(id, name, street, city, pin, designation, salary, Department: necessary and/or overridden methods) to implement HAS-A relationship.</p> <p>4.5 Insert overloaded methods 'offer' in the class to implement the relationship 'Department offers Course' where Course is a class Course(courseCode, title, courseOutcomes, content)</p> <p>4.6 In main method, declare a reference variable vehicle of class Vehicle and create an object of class Car which will be referenced by vehicle.Call getName() method (in 4.2) on the object. (Hint: Reference Variable Casting)</p> <p>4.7 Modify the classes Vehicle and Gadget implement the interface Taxable. Hence override respective methods.</p> <p>4.8 Identify default and parameterized constructors in class Department. In main method initialize objects of class Department using all the overloaded constructors</p> <p>4.9 Modify the classes Car and Laptop to override the implemented methods in 4.7</p> <p>4.10 Modify the class Gadget to add a data member</p>	12



		gadgetCount such that its value will incremented as soon as a new object is initialized. Print its value after initializing 3 objects.	
5.	3	<p>5.1 Given 50 literals by faculty check whether each literal is legal or not. Justify your answer. Determine the type of the literal. Define all the legal literals in main method and display them.</p> <p>5.2 Given some sample code like</p> <pre> class Layout { // class static int s = 343; // static variable int x; // instance variable { x = 7; int x2 = 5; } // initialization block Layout() { x += 8; int x3 = 6;} // constructor void doStuff() { // method int y = 0; // local variable for(int z = 0; z < 4; z++) { // 'for' code block y += z + x; } } } </pre> <p>Predict the output and justify your answer. Type and modify the code to print values of each variable just before every closing curly brace. Try compile the class..</p> <p>5.3 Foo Corporation needs a program to calculate how much to pay their hourly employees. The Ministry of Labor requires that employees get paid time and a half for any hours over 40 that they work in a single week. For example, if an employee works 45 hours, they get 5 hours of overtime, at 1.5 times their base pay. The Government of Maharashtra requires that hourly employees be paid at least RS. 250.00 an hour. Foo Corp requires that an employee does not work more than 60 hours in a week. Define a method calculateWedge() with necessary parameters and appropriate return type in the class Foo.</p> <p>5.4 Write a Java method to add 2D matrices.</p>	8
6.	4	<p>6.1 Create 2 arrays of objects of class Point (refer 2.2) and initialize them using basic and enhanced for loop respectively.</p> <p>6.2 Write a program to display all the digits of a n digit decimal number where n is input by user in command line.</p> <p>6.3 Write a program to demonstrate try, catch and finally blocks.</p> <p>6.4 Create a csv file which will contain 10 integers separated by comma in a spreadsheet. Read the file using class java.util.Scanner and display the sum of the numbers in the file. Handle all possible exceptions.</p> <p>6.5 Define your own exception and handle it.</p> <p>6.6 Create classes ThreadExtends and ThreadImplements respectively extending class Thread and interface Runnable. Print the name of the class while implementing run() method. Create objects of both the classes in main and invoke life cycle methods on the objects.</p>	10
7.	5	7.1 Write a Java program to take character, integer, and String input from user and display it.	12



		<p>7.2 Write a Java program to create, read and modify a file.</p> <p>7.3 Use the method you defined in 5.3 to store monthly wedges disbursed to each employee in a file. Every record should be stored in a new line.</p> <p>7.4 Use the output of 7.3 to create a file record of yearly wedges for a given financial year of Foo Corp.</p> <p>7.5 Create two objects of class Path viz., source and target. Perform the following operations</p> <ol style="list-style-type: none"> Create a file at source Copy a file from source to target Move a file from source to target Delete a file from source Retrieve information about source and target. Normalize the paths like "/a/.b/.c", ".classpath", "/a/b/c/..", "../a/b/c", "/Build_Project/scripts/../../My_Project/source" Resolve a Path of a file Relativize a path with respect to other path. <p>7.6 Write a program to display Dates, Numbers and Currencies in different formats.</p>	
8.	6	<p>8.1 Write a Java program to override toString() and equals() methods on a class.</p> <p>8.2 Write a program to use ArrayList.</p> <p>8.3 Given a List<List<String>> write a program to convert it into a List<String>.</p> <p>8.4 Write a generic method to exchange the positions of two different elements in an array.</p> <p>8.5 Write a generic method to count the number of elements in a collection that have a specific property (for example, odd integers, prime numbers, palindromes)</p>	8
9.	7	<p>9.1 Write a class Outer which will contain a nested class named NestedClass.</p> <p>9.2 Modify the Outer class to include an inner class named Inner.</p> <p>9.3 Write a program to create an anonymous class while overriding a method in an interface.</p> <p>9.4 Create JAR file in Terminal/ Command Prompt and in IDE</p> <p>9.5 Deploy a Java Project to create an Executable JAR</p>	4
10.	All	<p>5 online quizzes of at least 10 objective questions based on above contents shall be conducted with the help of any free open source learning management system.</p> <p>Each quiz will be of duration 20 minutes duration and must contain the questions of the following category:</p> <ol style="list-style-type: none"> General Concept (MCQs) (4 questions) What's wrong with the given code? (2 questions) Guess the output of the given code (3 questions) Write the code/ Fill in the missing code(1 question) 	
11.	All	<p>Assignment</p> <p>Solve total 200 Objective Questions based on the above contents.</p> <p>Note: Questions should be categorized as said in 10.</p>	
Total			60



Reference Books:

Sr. No.	Book Title	Author	Publication
1	Oracle Press OCA/OCP Java® SE 7 Programmer I & II Study Guide (Exams 1Z0-803 & 1Z0-804)	Kathy Sierra Bert Bates	McGraw Hill Education
2	Java™ The Complete Reference Ninth Edition	Herbert Schildt	McGraw Hill Education
3	Head First Java	Kathy Sierra Bert Bates	O'Reilly

Web References:

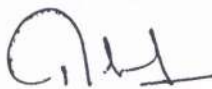
1. <https://docs.oracle.com/javase/tutorial/>
2. <http://www.angelikalanger.com/GenericsFAQ/JavaGenericsFAQ.html>
3. <https://www.youtube.com/playlist?list=PL9DF6E4B45C36D411>
4. http://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

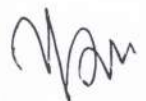
Course Curriculum Development Committee:**Internal Faculty**


Ms. Jijnasa S. Patil (Lecturer in Computer Engineering, Government Polytechnic Mumbai)

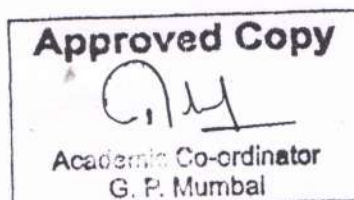
External Faculty

1. Mr. Suraj S. Bhosale (Lecturer in IT, Government Polytechnic, Jalgaon)
2. Mr. Vaibhav Vasani, (Assistant Professor, Shah & Anchor Kutchhi Engineering College, Mumbai)


Academic Coordinator
(Dr. R. A. Patil)


Head of Department
(Computer Engineering)


Principal
Govt. Polytechnic Mumbai



CO VsPO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	2	1	2	1	3
CO2	1	3	3	2	3	2	2	2	1	3
CO3	1	3	3	3	2	1	1	1	1	3
CO4	1	3	3	3	2	1	1	1	1	3
CO5	1	3	3	3	2	1	1	1	1	3
CO6	1	3	2	3	2	1	1	1	1	3

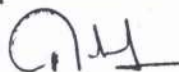
CO vs. PSO Matrix

COs		PSO1	PSO2	PSO3
CO1	Know the Basic building blocks of a Java Program.	3	2	3
CO2	Describe Object Oriented Features of Java Language.	3	3	3
CO3	Explain the terms like Assignments, Garbage Collection and Operators in Java.	3	3	3
CO4	Predict the flow of execution of Java programs using constructs, loops and exceptions.	3	3	3
CO5	Develop a Java Application using I/O, Generics and Collection.	3	3	3
CO6	Use Inner classes in Java Application Development.	3	3	3

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Declarations and Access Control	CO 1
2	2	Object Orientation	CO 2
3	3	Assignments, Operators, Strings and Arrays	CO 3
4	4	Flow Control, Exceptions, and Assertions	CO 4
5	5	I/O, Formatting, and Parsing	CO 5
6	6	Overview of Generics and Collections	CO 5
7	7	Inner Classes and Other topics	CO 6

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Programme Code: IF												
Course Code: IT16307				Course Title: Multimedia Techniques								
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits				Duration of Examination			Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	TH	TS	PR	OR	TW	Total
01	--	04	05	--	--	--	--	--	50*	--	25	75
(*) indicates assessment by Internal and External examiners												

Rationale:

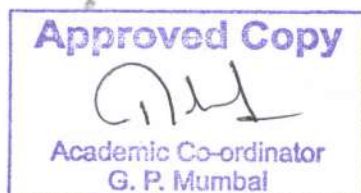
For effective communication, teaching, presentation multimedia is the essential feature. The Multimedia Techniques course is designed for using multimedia technology to enhance their professional skills to pursue a career in multimedia. The course focuses on specialized technical and creative skills and provides students with critical reflective skills. It also offers students knowledge in theories and methodologies relevant to current industry professional practice and research.

Course Outcomes:

Student should be able to:

CO1	Explain different multimedia elements.
CO2	Demonstrate use of different compression, decompression techniques.
CO3	Create animations with different tools such as FLASH, MAYA.
CO4	Demonstrate the use of animation, digitized sound, video control and scanned images.
CO5	Describe Multimedia Authoring System.

Topic No	Contents
1	Multimedia Elements 1.1 Evaluation of Multimedia systems: Multimedia Elements: Facsimile, Document image, photographic image, Geographic's information system maps, Full motion and live video. 1.2 Categorization of Multimedia 1.3 Multimedia Application: Document imaging, Image processing and Image Enhancement, OCR, Handwriting recognition, Non textual Image recognition, Full motion Digital Video application and Electronics message.

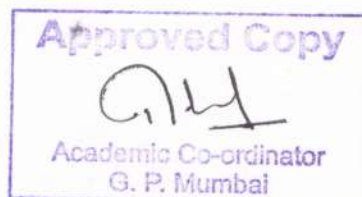


	<p>1.4 I/P, O/P devices: Input- Pen-Input, Image Scanner, Charge Coupled Devices, Digital Camera, Output, Display System Technology, Display Terminology</p> <p>1.5 Storage media: Magnetic Media Technology, Hard disk Technology, RAID, Optical Media</p>
2	<p>Compression/Decompression & File Formats</p> <p>2.1 Compression and Decompression: Types, Need of Data compression, Color gray Scale and Still Video Image.</p> <p>2.2 Video Compression Technique: Simple Compression Technique, Interpolative, Predictive</p> <p>2.3 JPEG Compression: Definition, JPEG Components, methodology of JPEG Standard</p> <p>2.4 File Formats: RIF, TIFF and RIFF specifications.</p> <ul style="list-style-type: none"> • MIDI File Format. • AVI File format, Introduction to MPEG • WAVE file format
3	<p>Multimedia I/O Technology : Audio, Video Digitalization</p> <p>3.1 Multimedia System Architecture</p> <p>3.2 Basics of Digital Audio: Digitization of Sound, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR)</p> <p>3.3 Color use in Image and Video: Color Science: Color Characteristics, Color Models in Images and Video.</p> <p>3.4 Fundamental Concepts in Video: Types of Video Signals, Components of Video, Composite Video, S-Video, Analog Video, Digital Video, High Definition TV</p>
4	<p>Animation: Multimedia Tool -1 FLASH</p> <p>4.1 Introduction to Multimedia tool and Versions of FLASH</p> <p>4.2 Creating & Modifying elements: Line tool, fill/attributes, different shapes, text tools & pen tool</p> <p>4.3 Selecting lines fill with arrow tool, selecting shapes, using lasso tool performing basic editing tools, selecting & deselecting Elements, modifying created objects.</p> <p>4.4 Keyframes, Timeline, Tweening and Motion and Layers</p> <p>4.5 2D Versus 3D Animation,</p> <p>4.6 Creating Animation – Timeline and frame based ,Timeline and Tween based</p> <p>4.7 Banners in flash</p> <p>4.8 Use and Application of FLASH animation Software</p>

5	Graphics Multimedia Tool-2. Photoshop & Maya 5.1 Concept of Processing Digital Images. 5.2 Concept and Use of Photoshop 5.3 File Formats and Versions of Photoshop 5.4 Applications of Photoshop 5.5 Tools: Cropping and slicing ,Drawing Measuring and Navigation ,Selection Typing, Video Editing 5.6 Introduction to Corel Draw 5.7 Introduction about VFX, its advantages & applications 5.8 Multimedia Tool-4.MAYA 5.9 Introduction to MAYA <ul style="list-style-type: none"> • Overview ,Components • MAYA Embedded Language • System Requirements
6	Multimedia Authoring and User Interface 6.1 Multimedia Authoring System and its types. 6.2 Hypermedia Application and Design consideration. 6.3 User Interface Design 6.4 Information Access. 6.5 Object Display / Playback Issues. 6.6 Introduction to Distributed Multimedia Systems

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks
1	Multimedia Elements	4	Not Applicable
2	Compression/Decompression & File Formats	5	
3	Multimedia I/O Technology : Audio, Video Digitalization	5	
4	Animation: Multimedia Tool -I FLASH	6	
5	Graphics Multimedia Tool-2. Photoshop & Maya	6	
6	Multimedia Authoring and User Interface	4	
Total		30	



List of Practical's:- (Minimum 10 experiments should be performed)

Note: Perform practical's using Adobe Animate CC or Maya or any open source animation tool with latest version.

Sr.No.	Unit	Title of Experiment	Approx. Hours
1	1	Classify and analyze characteristic, functionality and performance of different multimedia Input Output devices.	2
2	2	Demonstrate Compression and decompression, different file formats.	4
3	3,4,5	Acquainting with the interface, tools and commands of either Flash or MAYA software	4
4	4	Design a banner in flash with animation	4
5	4	Develop Presentation by using play, pause, stop button instances using Action Script2.0 of Adobe Flash.	4
6	4	Create a Presentation by using different tools in Flash(Lasso, shapes, arrow and etc)	4
7	4	Design a joker character in flash.	4
8	4,5	Develop an animation of Joker's face by using Key frames.(Laughing and Crying)	4
9	4,5	Create an animation of Joker's face using Tweening and Motion .(Laughing and Crying)	4
10	4,5	Design and develop a forest of tree with flowers & fruits from a small plant using different layers & Frame transition time.	4
11	3,4,5	Insert audio to relevant frames that has lighting & rain effect.	4
12	4,5	Convert created work into file format, which can be published on web.	4
13	5	Create Images by using Photoshop Tools.	4
14	5	Create Animation by using MAYA and its Tools.	4
15	3,4,5	Mini Project: Students should create a movie of minimum 6 minutes playtime using Adobe Animate CC or MAYA software.	6
		Total	60

Reference Books:

Sr. No.	Title	Author	Publication
1	Multimedia Systems Design	Prabhat K. Andheigh, Kiran Thakrar, John F	Prentice Hall of India
2	Multimedia Systems	Koegel Buford	Pearson Education
3	Micromedia Flash for Windows and Macintosh	Katherine Ulrich	Pearson Education
4	Multimedia Communication	R. Steimnetz, K.Nahrstedt	Pearson Education

Web References:

- <https://www.tutorialspoint.com/listtutorials/flash>
- <http://nptel.ac.in/courses/106102065/33>
- <http://www.adobe.com/in/products/animate.html>
- <https://www.autodesk.in/products/maya/overview>

Course Curriculum Development Committee:**a. Internal Faculty**

Ms. M. S. Arade (Lecturer, Information Technology, Govt. Polytechnic Mumbai)


Ms. N. A. Wankhade (Lecturer in Information Technology, Govt. Polytechnic Mumbai)

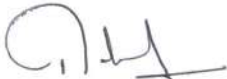
Ms. Pradnya Natekar (Visiting Faculty, Information Technology, Govt. Polytechnic Mumbai)

b. External Faculty

Ms. Shubhangi Wadekar (Lecturer, Information Technology, Government Polytechnic Nashik)

Mr. Krantikumar Arade (Senior Specialist - CRM at Hitachi Solutions India Pvt Ltd, Pune, India)


Academic Coordinator
(Dr. R. A. Patil)


Head of Department
(Information Technology)


Principal
Govt. polytechnic Mumbai

Programme : Diploma in Information Technology									
Course Code: IT16308				Course Title: Operating System					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70(3 Hrs)	30	50*	--	---	150

*Assessment by External Examiner

Rationale:

An operating system is the core software of any computer system. This is the basic software or platform on which other software work. Every student of IT and computer science must therefore understand basic structure of an operating system.

After learning this subject student will be able to discriminate between various types of operating systems, its processes, deadlock, memory management and file management.

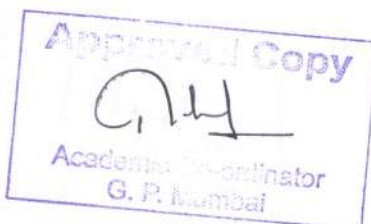
Course Outcomes:

Student should be able to:

CO1	Define operating system and distinguish between various operating systems.
CO2	Describe the concept of process and threads.
CO3	Analyze the performance of various process scheduling algorithms and able to write program for them.
CO4	Comprehend the synchronization, deadlock & memory management systems.
CO5	Write program for various page replacement algorithms & analyze their performance.
CO6	Explain various file systems.

Course Content Details:

Unit No	Topics / Sub-topics
1	Overview of Operating System 1.1 Introduction to Operating System : Concept, Components of Computer System 1.2 Role of the operating system 1.3 Different Types of operating systems- 1. Batch operating system 2. Multiprogramming system 3. Multitasking operating system 4. Time Shared system 5. Multiprocessor Systems 6. Cluster Systems 7. Distributed Systems



	<ul style="list-style-type: none"> 8. Real time systems 9. Open Source operating system 10. Mobile Operating System
2	<p>Operating System Principles</p> <ul style="list-style-type: none"> 2.1 Different Services of Operating System. 2.1 Components activities- Process Management, Main Memory Management, Secondary storage management, I/O System management, File Management. 2.2 System Calls - Concept, Types and Uses 2.3 System boot, boot loader
3	<p>Process & Thread Management</p> <ul style="list-style-type: none"> 3.1 Process-Concept, process states, Process Control Block 3.2 Process Scheduling- Scheduling Queues, Types of Schedulers, Context switch 3.3 Inter-process communication- Introduction, shared memory system & message passing system, 3.4 Synchronization- Concept, Critical Section problem 3.5 Threads – Benefits, users and kernel threads, 3.6 Multithreading Models – One to One , Many to One, One to Many, Many to Many
4	<p>Process Scheduling</p> <ul style="list-style-type: none"> 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 – <ul style="list-style-type: none"> 1. First come first served (FCFS) 2. Shortest Job First (SJF) 3. Shortest Remaining Time (SRTN) 4. Round Robin (RR) 5. Priority scheduling 6. Multilevel queue scheduling
5	<p>Deadlock</p> <ul style="list-style-type: none"> 5.1 System Models 5.2 Necessary Conditions leading to Deadlocks 5.3 Deadlock Handling - <ul style="list-style-type: none"> 1. Deadlock Prevention 2. Deadlock Avoidance: Safe state, Resource allocation graph, Bankers algorithm and example 3. Deadlock Detection: Single instance of each resource type



	5.4 Deadlock Recovery : Process termination , Resource Preemption
6	Memory Management 6.1 Background – Basic memory hardware, Address binding, Logical & physical address space, 6.2 Swapping 6.3 Contiguous Memory Allocation, Fragmentation. 6.4 Paging, Page table, Page fault, Segmentation 6.5 Virtual Memory – Concept, Demand paging. 6.6 Page replacement algorithm- 1. First in first out(FIFO) 2. Least recently used (LRU), 3. Optimal page replacement 4. Not recently used (NRU).
7.	File System 7.1 File – Concepts, Attributes, Operations, Types, File System Structure. 7.2 Access Methods – Sequential, Direct. 7.3 Allocation Methods- Contiguous, Linked, Indexed 7.4 Directory Structure – Single level, Two level

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Overview of Operating System	6	4	4	--	8
2	Operating System Principles	6	2	4	4	10
3	Process & Thread Management	6	4	4	2	10
4	Process Scheduling	7	2	4	6	12
5	Deadlock	6	--	4	6	10
6	Memory Management	10	4	4	6	14
7	File System	4	2	4	--	6
Total		45	18	28	24	70

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

		<p>Calculate average waiting time, average turnaround time and throughput.(Given the list of processes, their CPU burst times and arrival times , time slice = 3 ms)</p> <table><tr><th>Process</th><th>Arrival Time</th><th>Execute Time</th></tr><tr><td>P0</td><td>0</td><td>5</td></tr><tr><td>P1</td><td>1</td><td>3</td></tr><tr><td>P2</td><td>2</td><td>8</td></tr><tr><td>P3</td><td>3</td><td>6</td></tr></table>	Process	Arrival Time	Execute Time	P0	0	5	P1	1	3	P2	2	8	P3	3	6																																											
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P2	2	8																																																										
P3	3	6																																																										
8	4	<p>Write a program to implement Priority Scheduling Algorithm Calculate average waiting time, average turnaround time and throughput.(Given the list of processes, their CPU burst times and arrival times=0 for all processes.)</p> <table><tr><th>PROCESS</th><th>BURST TIME</th><th>PRIORITY</th></tr><tr><td>P1</td><td>21</td><td>2</td></tr><tr><td>P2</td><td>3</td><td>1</td></tr><tr><td>P3</td><td>6</td><td>4</td></tr><tr><td>P4</td><td>2</td><td>3</td></tr></table>	PROCESS	BURST TIME	PRIORITY	P1	21	2	P2	3	1	P3	6	4	P4	2	3	2																																										
PROCESS	BURST TIME	PRIORITY																																																										
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P3	6	4																																																										
P4	2	3																																																										
9	5	<p>Write a program to implement Bankers Algorithm. Determine need matrix and Safety sequence for following system including 5 processes p0,p1,p2,p3,p4 and three resource types A,B ,C</p> <table><tr><th rowspan="2">Process</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr><tr><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr><tr><td>P₀</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td><td rowspan="5">3</td><td rowspan="5">3</td><td rowspan="5">2</td></tr><tr><td>P₁</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td></tr><tr><td>P₂</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td></tr><tr><td>P₃</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td></tr><tr><td>P₄</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td></tr></table>	Process	Allocation			Max			Available			A	B	C	A	B	C	A	B	C	P ₀	0	1	0	7	5	3	3	3	2	P ₁	2	0	0	3	2	2	P ₂	3	0	2	9	0	2	P ₃	2	1	1	2	2	2	P ₄	0	0	2	4	3	3	4
Process	Allocation			Max			Available																																																					
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10	6	<p>Write a program to implement First in first out (FIFO) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1</p>	2																																																									
11	6	<p>Write a program to implement Least recently used (LRU) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1</p>	2																																																									
12	6	<p>Write a program to implement Optimal page replacement (OPT) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames.</p>	2																																																									

		7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1	
13	6	Write a program to implement Not recently used (NRU) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1	2
14	1 to 6	Write a program which acts as a chat application between two users on the same computer, using shared memory concept.	2
Total			30

References/ Books:

Sr. No.	Book Title	Author	Publication
1	Operating System Concepts	Silberschatz Galvin, Gagne	John Wisley & Sons
2	Operating Systems	Achyut S. Godbole	Tata McGraw-Hill
3	Modern Operating System	Andrew S. Tanenbaum	Prentice Hall of India
4	System Programming & Operating System	D. M. Dhamdhare	TMH
5	Operating Systems	Milan Milenkovic	Tata McGraw Hill

Course Curriculum Development Committee:**a. Internal Faculty**

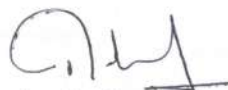
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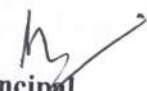
b. External Faculty

Ms. Pooja Chelani (Lecturer, Computer Engineering., Govt. Polytechnic Pen)

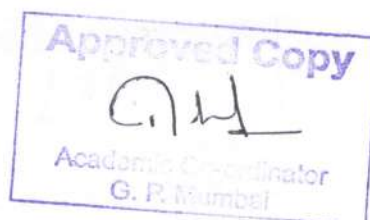
Mr. Krantikumar Arade (Senior Specialist - CRM at Hitachi Solutions Pune Pvt Ltd.)


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Principal
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Operating System



IT16308

Programme : CE/ME/EC/CO/IF/IS/EE/LG/LT									
Course Code: ME16 502				Course Title: Entrepreneurship Development					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
1	2	-	3	-	-	-	25*	25	50

*External Examiner

Rationale:

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white-collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

Course Outcomes:

Student should be able to

CO1	Appreciate the concept of Entrepreneurship
CO2	Identify entrepreneurship opportunity
CO3	Understand the Marketing Strategy .
CO4	Collect and use the information to prepare project report for business venture.
CO5	Develop awareness about enterprise management

Course Content Details:

Sr. No.	Contents
1.	INTRODUCTION <ul style="list-style-type: none"> Definition of Entrepreneur. Characteristics of Entrepreneur. Functions of an Entrepreneur. Barriers to Entrepreneur. Distinction between Entrepreneur, Manager and Intrapreneur Women Entrepreneur-problems and developing trends. Entrepreneurship-definition, need.
2.	FROM BUSINESS IDEA TO OPPORTUNITY <ul style="list-style-type: none"> Identifying trends, opportunities and ideas. Creativity techniques for idea generation. Evaluate business opportunities Use of SWOT analysis.

3.	MARKET ASSESSMENT AND PRODUCT FEASIBILITY <ul style="list-style-type: none"> Marketing -Concept and Importance Market Identification, Customer need assessment, Market Survey Meaning and definition of product feasibility Technical, Market, Financial feasibility including break even analysis.
4.	SUPPORT SYSTEMS <ul style="list-style-type: none"> Information Sources Information related to project, procedures and formalities Support Systems <ul style="list-style-type: none"> Business Planning & Requirements for setting up an SSI Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS), Statutory requirements and agencies.
5.	PROJECT/BUSINESS PLAN <ul style="list-style-type: none"> Meaning and Importance Concept of vision and mission Components of project report/profile
6.	ENTERPRISE MANAGEMENT AND MODERN TRENDS <ul style="list-style-type: none"> Essential roles of Entrepreneur in managing enterprise E-Commerce: Concept and process Global trends and opportunities. Steps in starting small scale industry Causes Of Sickness

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	INTRODUCTION	01				
2	FROM BUSINESS IDEA TO OPPORTUNITY	02				
3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	03				
4	SUPPORT SYSTEMS	02				
5	PROJECT/BUSINESS PLAN	04				
6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	04				
Total		16				

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

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

Term Work

Term work consists of following interactive type assignments. Faculty acts as a facilitator in providing conducive, dynamic environment, exposing students to various aspects of entrepreneurship. Assignments are aimed at compelling the students to critically think and apply the concepts learnt, leading to better insight development.

Sr. No	Unit	Assignments	Hours
1		Assimilation Of Profile Of A Successful Entrepreneurs Every student will study the biography of a successful entrepreneur and make a write up of two pages, indicating milestone achievements. Summarize the important traits and share their understanding in the peer group.	
2		Assess yourself as an entrepreneur? Several skills and traits are essential in an entrepreneur, to achieve success. What is your potential in this regard?...Assess yourself and reflect upon the findings. Faculty will provide you a suitable instrument.	
3		Brain Storm To Generate Business Ideas. Brain storming is a group creativity exercise designed to come out with a number of solutions to a problem. Follow the steps. <ul style="list-style-type: none"> ✓ State the problem (Ex. What business would you start if you are given Rs Lacs?) ✓ Select the participants ✓ Select a leader ✓ Set the stage Rules to be followed are, <ul style="list-style-type: none"> • Focus on quantity • Postpone criticism • Build on others ideas • Encourage crazy ideas • Work with a dead line 	
4		Identify A Business Opportunity Suitable For You <ul style="list-style-type: none"> ✓ This activity will help you to identify opportunity that may be right for you. Once identified you will use this business idea to carry out the mini project, throughout the session. ✓ List your interests and hobbies. List the business ideas that relate to each interest. Use the following steps to end up with the opportunity. ✓ Make SWOT analysis of self, cross out those ideas that no longer seem suitable for you. ✓ Assess your aptitude and identify those ideas that match with 	

		<p>your aptitude</p> <ul style="list-style-type: none"> ✓ Make a matrix of advantages and disadvantages of remaining ideas, find which one is of maximum advantage ✓ Use internet or library and find out at least one source of information for each idea. ✓ Choose one of the business opportunities that suit your life style requirements. ✓ Write vision and mission statement. Set personal financial and non financial goals you hope to achieve in five years perspective. Be realistic and be sure to include specific activities for each plan. 	
5		<p>Begin To Develop Your Business Plan</p> <ul style="list-style-type: none"> ✓ Write a vision and mission statement for the business enterprise ✓ Describe one page report that fully describes your product or service and how it differs from what is currently available. ✓ List your short, medium and long term goals. What steps do you need to achieve each of these goals? Do you foresee any obstacles in attaining them? What are they? ✓ What are the economic, technological or growth trends in this industry? Is the location of your business is a critical factor in its success? Why or why not? 	
6		<p>Design A Market Strategy</p> <ul style="list-style-type: none"> ✓ Identify the market for your business. Use the secondary data source that could help you assess demand for your product or service. ✓ Based on secondary data, develop a customer profile. Figure out which market segment of your industry you are targeting. be specific. ✓ Develop a questionnaire to conduct primary data research. Conduct a mock survey and analyze the results. Determine what course of action you will take? ✓ Determine who your competitor are, both direct and indirect. Analyse each competitor in terms of price, location, facility, strength and weakness. Determine strategy to deal with each competitor. ✓ Write down your strategies for maintaining customer loyalty, and describe why you think each one will work. 	
7		<p>Find Out Break Even Point For Your Business</p> <p>Perform a break even analysis for your business. How many units you are required to sell to break even? Is this a feasible number? Why or Why not? Can you think of ways to lower the breakeven point?</p>	
8		<p>Feasibility Study Reports</p> <p>Make a feasibility study analysis of sample reports provided and discuss your observations in the class.(Group work each consisting 4 students)</p>	
9		<p>Interactive Session With An Entrepreneur</p> <p>In live conversation with an entrepreneur raise the issues of your interest pertaining to various aspects of entrepreneurship and make</p>	

		a report on it.	
10		<p>Mini Project Develop a mini project on a business opportunity incorporating various aspects as per the standard format provided. This activity should be carried out on continual basis, under the guidance of the concerned faculty.</p> <p>Components of Project Report:</p> <ol style="list-style-type: none"> 1. Project Summary (One page summary of entire project) 2. Introduction (Promoters, Market Scope/ requirement) 3. Project Concept & Product (Details of product) 4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength) 5. Manufacturing Process & Technology 6. Plant & Machinery Required 7. Location & Infrastructure required 8. Manpower (Skilled, unskilled) 9. Raw materials, Consumables & Utilities 10. Working Capital Requirement (Assumptions, requirements) 11. Market (Survey, Demand & Supply) 12. Cost of Project, Source of Finance 13. Projected Profitability & Break Even Analysis 14. Conclusion. 	

Notes: If possible an industrial visit should be arranged or videos should be shown of different die and operations.

Learning Resources:

1) Reference Books:

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. Ltd. New Delhi.
2	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat, India
3	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	P.H. (079) 3969163, 3969153
4	National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	E-mail : ediindia@sancharnet.in/olpe@ediindia.org
5	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta	
6	A Handbook of New Entrepreneurs	P.C.Jain	Website :

7	Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebastian	http://www.ediindia.org
8	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
9	Entrepreneurship Development	Special Edition for MSBTE	McGraw Hill Publication
10	Entrepreneurship Development	-	TTTI, Bhopal / Chandigarh


2) VIDEO CASSETTES


NO	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat, India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in / olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

Course Curriculum Development Committee:**a. Internal Faculty**

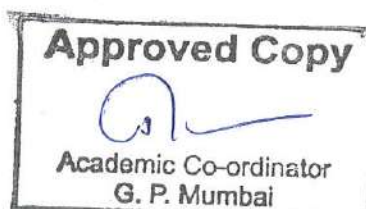
- i. Mr. S.V.Joshi.
- ii. Mr. B.B.Kulkarni.

b. External Faculty


Academic Coordinator
 (Dr. R.A. Patil)


Head of Department
 (Mechanical Engineering)


Principal
 Govt. polytechnic Mumbai



Course Name:- Entrepreneurship Development Course Code:- me 16 502

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	-	-	1	-	2	2	2	3
CO2	1	3	-	-	1	-	2	2	2	3
CO3	1	3	-	-	1	-	2	2	2	3
CO4	1	2	-	-	1	-	2	2	2	3
CO5	1	3	-	-	1	-	2	2	2	3

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Appreciate the concept of Entrepreneurship	-	3	2
CO2	Identify entrepreneurship opportunity	-	3	2
CO3	Understand the Marketing Strategy.	-	3	2
CO4	Collect and use the information to prepare project report for business venture.	-	2	2
CO5	Develop awareness about enterprise management	-	3	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	INTRODUCTION	CO1
2	2	FROM BUSINESS IDEA TO OPPORTUNITY	CO1 & 2
3	3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	CO2 & 3
4	4	SUPPORT SYSTEMS	CO3 & 4
5	5	PROJECT/BUSINESS PLAN	CO4 & 5
6	6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	CO1, 2 & 4

