GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	**DIPLOMA IN CM/IT**
LEVEL NAME	:	**PROFESIONAL COURSES**
COURSE CODE	:	**CM404E$**
COURSE TITLE	:	**OPERATING SYSTEMS**
PREREQUISITE	:	**NIL**
TEACHING SCHEME	:	**TH: 03; TU: 00; PR: 02(CLOCK HRs.)**
TOTAL CREDITS	:	**04 (1 TH/TU CREDIT =1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**
TH. TEE	:	**03 HRs**
PR. TEE	:	**02 HRs (External)**
PT.	:	**01 HR**

❖ RATIONALE:

The course provides the students with an understanding of the basic concepts of operating system and its working. Operating Systems are very essential components of the Computers. It is the interface between the user and the computer system. It is the first piece of software to run on a computer system when it is booted. Its job is to co-ordinate and provides services for the execution of application software. This is core technology subject and the knowledge of which is absolutely essential for Computer Engineers .It familiarizes the students with the concepts and functions of operating system. This subject provides knowledge to develop systems using advanced operating system concepts.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Implement the functions of operating systems and the system calls.
2. Apply techniques of memory management and file system management.
3. Analyse various algorithms based on CPU scheduling, memory management and deadlock.
4. Execute the algorithms for Schedulers, Inter-process communications.
5. Perform Memory Management techniques.
6. Implement the file system and security concerns.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Introduction to Operating System	1. Define various terms related to Operating system 2. State the organization and architecture of OS 3. List various operations of OS and describe their working. 4. List types of system calls 5. Compare various operating systems.	1.1 Introduction to Operating System - Organization , Architecture, Operations 1.2 Process , Memory , Storage Management 1.3 Special-Purpose Systems, Computing Environments, Open-Source Operating Systems. 1.4 System Calls, Types of System Calls 1.5 System Programs, Operating-System Structure	**6**
2. Process Management	1. Describe process scheduling. 2. State various operations on processes. 3. Define Inter process Communication 4. Define thread. 5. Compare multithreading and it's various models. 6. Calculate average waiting time. 7. Evaluate the scheduling algorithms	2.1 Process Concept, Process Scheduling, Operations on Processes 2.2 Inter process Communication 2.3 Threads, multithreading model 2.4 Basic Concepts, Scheduling Criteria. Scheduling Algorithms, Algorithm evaluation	**9**
3. Process Synchronization	1. Define Race condition 2. Define Semaphore. 3. Describe Critical-Section Problem. 4. State the solution for Critical-Section Problem 5. State various problems of synchronization	3.1 The Critical-Section Problem 3.2 Peterson's Solution, Synchronization Hardware 3.3 Semaphores, Classic Problems of Synchronization	**6**
4. Deadlocks	1. Define related terms. 2. Identify deadlocks. 3. Describe resource allocation graph. 4. Find safe state. 5. State provision for recovery from deadlock.	4.1 System Model, Deadlock Characterization 4.2 Methods for Handling Deadlocks 4.3 Deadlock Prevention, Deadlock Avoidance 4.4 Deadlock Detection, Recovery from Deadlock	**8**
5. Memory Management	1. Define related terms . 2. Describe swapping. 3. Describe Paging, Paging table.	5.1 Main Memory: Background , Swapping 5.2 Contiguous Memory Allocation 5.3 Paging, Structure of the Page	**10**

	4. State various operations on segment table. 5. Apply Page replacement policy for solving virtual memory problem. 6. Describe thrashing	Table 5.4 Segmentation 5.5 Virtual Memory: Background, Demand Paging, Copy on Write, Page Replacement. Allocation of frames, Trashing. 5.6 Memory Mapped Files	
6. File System and Security	1. Define related terms 2. Describe related terms. 3. Describe File system 4. List various goals of protection. 5. Compare access matrix, access control 6. Describe security problem.	6.1 File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection 6.2 File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management 6.3 Protection: Goals of Protection, Principles of Protection, Domain of Protection 6.4 Access Matrix, Implementation of Access Matrix, Access Control 6.5 Security: The Security Problem, Program Threats, System and Network Threats	**09**
		Total Hrs.	**48**

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Execute the Disk Operating System (DOS) commands	Introduction to Operating System	2
2.	Install and configure Windows 9x,Windows NT, Windows 2000 & Windows XP Operating Systems.		4
3.	Execute the LINUX Commands - man, apropos, clear, ls, mkdir, cd, rmdir, pwd, rm, touch, mv, tr, wc, sort, grep, wall, write, who, chmod, useradd, usermod, kill, ssh, ftp, telnet		2
4.	Develop, debug and Execute a C program to simulate the FCFS CPU scheduling algorithms to find turnaround time and waiting time.	Process Management	2
5.	Develop, debug and Execute a C program to simulate the SJF CPU scheduling algorithms to find turnaround time and waiting time.		2
6.	Develop, debug and Execute a C program to simulate the Round Robin CPU scheduling algorithms to find turnaround time and waiting time.		2
7.	Develop, debug and Execute a C program to simulate the priority CPU scheduling algorithms to find turnaround time and waiting time.		2
8.	Develop, debug and Execute a C program to simulate producer-consumer problem using semaphores.	Process Synchronization	4
9.	Develop, debug and Executea C program to simulate FIFO page replacement algorithms	Memory Management	2
10.	Develop, debug and Execute a C program to simulate LRU page replacement algorithms		2
11.	Develop, debug and Execute a C program to simulate Optimal page replacement algorithms		2
12.	Develop, debug and Executea C program to simulate LFU page replacement algorithms		2
13.	Develop, debug and Execute a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit		2
		Skill Assessment	2
		Total Hrs	32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1.	Introduction to Operating System	04(02)	04(00)	00(00)	**08(02)**
2.	Process Management	06(02)	04(04)	06(04)	**16(10)**
3.	Process Synchronization	02(00)	06(04)	00(00)	**08(04)**
4.	Deadlocks	02(00)	04(04)	06(00)	**12(04)**
5.	Memory Management	02(04)	08(00)	06(06)	**16(10)**
6.	File System and Security	02(06)	04(04)	04(00)	**10(10)**
	Total	**18(14)**	**30(16)**	**22 (10)**	**70 (40)**

R – Remember U – Understand A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	2	R	2																
02	1	U	4	6	A	4	2	U	4	3	U	4	4	U	4				3/5
03	2	R	4	4	U	4	6	U	4	2	A	4	5	R	4				3/5
04	5	U	4	5	U	4	1	R	4	2	U	4	6	U	4				3/5
05	2	A	6	4	A	6	5	A	6										2/3
06	3	U	6	5	A	6	6	R	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	**CA** (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**70**	**28**	Theory Answer Sheets	1, 2, 3
				Total	**100**	**40**		
Direct Assessment Practical	**CA** (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	**25**	**10**		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**50**	**20**	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing flow chart	10
2	Writing program	10
3	Debug the program	10
4	Execution of program	10
5	Viva voce	10
	TOTAL	**50**

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

1. Computer Engineering:-

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	-
2	-	3	-	3	-	-	-		-	3	3	-
3	-	3	-	3	-	-	-	3	3	3	-	-
4	-	3	2	3	-	-	-	3	3	3	3	-
5	-	3	2	3	-	-	-	3	3	3	3	-
6	-	3	2	3	1	-	-	3	3	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

2. Information Technology:-

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	-
2	-	3	-	3	-	-	-		-	3	-	-
3	-	3	-	3	-	-	-	3	3	3	-	-
4	-	3	2	3	-	-	-	3	3	3	-	2
5	-	3	2	3	-	-	-	3	3	3	-	2
6	-	3	2	3	1	-	-	3	3	3	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Operating System Concepts	Abraham, Silberschatz , Greg Gagne , Peter B. Galvin, Wiley India, 9th Edition, 2012	13: 9788126520510
2.	Operating Systems: Internals and Design Principles	William Stallings. Pearson 8th Edition, 2014	13:9780133805918
3.	Operating System	Achyut Godbole, Atul Kahate, Tata McGraw Hill Education,3rd Edition, 2005	13:9780070702035
4.	Operating System Concepts	EktaWalia, Khanna Publishers, 2nd Edition, 2015	13:9789380016658

❖ **E-REFERENCES:**

http://nptel.ac.in/courses/106108101/, **accessed on 21stAugust 2016**

https://onlinecourses.nptel.ac.in/noc16_cs10, **accessed on 21st August 2016**

https://www.youtube.com/watch?v=MaA0vFKt-ew, **accessed on 21st August 2016**

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. Mrs. A R Mahajan	Head, Information Technology	Government Polytechnic, Nagpur.
2	Mr. S.P. Lambhade	Head of Computer Engineering	Government Polytechnic, Nagpur.
3.	Shri R L Meshram	Lecturer in Information Technology	Government Polytechnic, Nagpur.
4	Shri L D Vilhekar	Lecturer in Information Technology	Government Polytechnic, Nagpur.
5	Shri. Atul Upadhyay	CEO	Vista Computers , Ram Nagar, Nagpur
6	Shri. N. V. Chaudhari	Asst. Professor (CSE)	DBACEO, Wanadongri, Nagpur
7	Shri. Manoj Jethawa	HOD Computer Science	ShriDattaMeghe Polytechnic, Nagpur

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(Member Secretary PBOS) **(Chairman PBOS)**