

PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2019-20 onwards)**Programme: **Master of Technology** Specialization: **Computer Science and Engineering** Semester –**I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100) Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total
MT1101	Research Methodology & IPR	3	1	-						Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/attendance Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Students will be able to understand research problem formulation.
	2. Able to analyze research related information and follow research ethics.
	3. Understand the importance of IPR and its protection for further research work.

Unit	Contents (Theory)	Marks Weightage
I	Research Methodology: Meaning; Objective & its types; Research Approaches ; Significance of Research; Research Methods Vs Methodology; Research Process; Criteria of Good Research; Meaning of research problem; Sources of research problem; Errors in selecting a research problem; Scope and objectives of research problem; Effective literature studies approaches; Plagiarism; Research Ethics; Problems Encountered by Researchers in India.	14
II	Concept and Importance in Research: Features of a good research design, Exploratory Research Design: concept types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Interpretation : Meaning & Technique; Precaution in Interpretation ; Significance of Report Writing; Layout of the Research Report ; Types of Reports; Precautions for Writing Research Reports ; Effective technical writing; Role of Computer software in report writing.	14
III	Data Collection: Collection of Primary Data ; Observation Method ; Interview Method ; Collection of Data through Questionnaires; Collection of Data through Schedules; Difference between Questionnaires and Schedules; Collection of Secondary Data.	14
IV	Hypothesis: Null Hypothesis & Alternative Hypothesis. Basic Concepts Concerning Testing of Hypotheses (Chi Square Test); Procedure for Hypothesis Testing; Flow Diagram for Hypothesis Testing. Qualities of a good Hypothesis.	14
V	Nature of Intellectual Property: Patents; Designs; Trade and Copyright. Process of Patenting and Development; technological research; innovation; patenting; development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents; Patenting under PCT. Patent Rights: Scope. Licensing and transfer of technology. Patent Information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. IPR of Biological Systems.	14

Text Book/References Books/ Websites

1. C . R. Kothari; Research Methodology; New Age Publication.
2. Wayne Goddard and Stuart Melville; Research Methodology: An Introduction.
3. Ranjit Kumar; 2nd Edition ; Research Methodology: A Step by Step Guide for beginners.

Suggested List of Laboratory Experiments :- (Expandable): Nil

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		L	T	P	External (70)	Internal (30)	Total (100) Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total
MTCS1102	Advanced Data Structures And Algorithms	3	1	-						Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test-- Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance Max. Marks: Nil

Pre-Requisite	Basic Knowledge of Computer storage techniques and types of data.
Course Outcome	1. To understand basic structure of computer and concept of cache mapping techniques.
	2. To perform computer arithmetic operations & to design memory organization that uses banks for different word size operations.
	3. To understand control unit operations & the concept of I/O organization.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to Data Structures & Algorithms :Introduction to Data Structures, Classification of Data Structures, Introduction to Arrays, Addressing in Arrays, Trees, Types, Traversal Schemes, Stack, Multi stack, Queue, Classification, Linked Lists, Types, Graphs, Traversal Schemes and their Applications and Operation, Introduction to Algorithms and Problem Solving.	14
II	Introduction to Analysis & Design of Algorithms Introduction to Analysis of Algorithms, Priori and Posteriori Analysis, Introduction to Algorithmic Complexity, Space and Time Complexity, Introduction to Asymptotic Notations, Introduction to Algorithmic Design Techniques, Divide & Conquer Technique, Linear Search, Binary Search, Sorting Algorithm Introduction to Greedy Strategy, Spanning Trees, Kruskal's and Prim's Algorithm, Knapsack Problem, Huffman Coding and Shortest Path Algorithm.	14
III	Introduction to Design Techniques Introduction to Dynamic Programming, 0/1 Knapsack Problem, Multistage Graphs, Reliability Design Problem, Introduction to Backtracking, 8 Queen's Problem, Hamiltonian Cycle Problem, Graph Coloring Problem, Introduction to Branch & Bound Technique, Traveling Salesman Problem, 15 Puzzle Problem and Introduction to Lower Bound Theory.	14
IV	Introduction to Complexity Classes Introduction to Complexity Classes, P, NP, NP Hard, NP Complete, Polynomial Time Reducibility, Introduction to Randomized Algorithms, its Applications, Introduction to Geometric Algorithms, its Applications, Introduction to Graph Algorithms and its Applications, Introduction to Parallel Algorithms and Approximation Algorithms.	14
V	Introduction to Programming Introduction to Programming, Programming Languages, Classification of Programming Languages, Object Oriented Programming, OOP Languages like C++, C# and Java, Introduction to Dynamic Memory Allocation and Garbage Collection.	14

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Text Book/References Books/ Websites

1. Horowitz Sahni, Computer Algorithms ; Galgotia Publication
2. Tanenbaum ; Data Structures using C & C++ ; Prentice Hall of India
3. Aho, Hopcroft & Ullman ; Design & Analysis of Computer Algorithms; Addison Wesley Publishing Company

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTCS1103	Advance Database Management System.	3	1	-			Min: 40 (D Grade)			Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test- -Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance Max. Marks: Nil

Pre-Requisite	Student should have basic knowledge of database concepts.
Course Outcome	1. To understand the fundamentals of database.
	2. To understand use of query language..
	3. To understand how to access data from database.

Unit	Contents (Theory)	Marks Weightage
I	RDBMS & Query Processing: Introduction to Relational Databases, Data Models, ER Diagrams, Specialization, Generalization, Aggregation and Association, Integrity Constraints, Extended ER diagram, Relational Algebra & Calculus, Functional, Multivalued and Join Dependency, Normal Forms, Query Processing and Optimization, Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Deductive Databases, Datalog and Recursion.	14
II	Types of Data Bases: Introduction to types of Databases, Image and Multimedia Databases, Modeling and Storage of Image and Multimedia Data, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS), WEB Database, Accessing Databases through WEB, WEB Servers, XML Databases and Commercial Systems	14
III	Object Oriented Data Base & Distributed Data Base : Introduction to Objected Oriented and Object Relational Databases, Modeling Complex Data Semantics, Objects, Object Identity, Object Reference, Architecture of Object Oriented and Object Relational Databases, Parallel and Distributed Databases, Distributed Data Storage, Characteristics, Distributed Query Processing and Optimization, Distributed Transaction Modeling and Concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases and Parallel Query Evaluation	14

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IV	Transaction Processing :Introduction to Transaction Processing, ACID Protocols, Advanced Transaction Processing, Nested and Multilevel Transactions, Compensating Transactions, Long Duration Transactions, Transaction Work Flows, Transaction Processing Monitors, Active Database and Real Time Databases, Triggers in SQL, Introduction to Event Constraint and Action, ECA Rules and Databases Recovery.	14
V	Data Mining & Data Warehousing :Introduction to Data Mining, Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery, Introduction to Data Warehousing, Data Warehousing Architecture, Multidimensional Data Model, Introduction to OLAP and OLTP, OLAP Types, OLAP Queries and Case Study of ORACLE.	14

Text Book/References Books/ Websites

1. Date, Kannan, Swaminathan; An Introduction to Database Systems; Pearson Education.
2. Silberschatz, Korth, Sudarshan; Database System Concepts; Mcgraw Hill
3. Ullman, J. D.,; Principals of database systems; Galgotia publications.

Suggested List of Laboratory Experiments :- (Expandable):Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100) Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total Nil
MTCS1104	Advance System Programming and Operating system	3	1	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test- -Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance Max. Marks: Nil

Pre-Requisite	Student should have basic knowledge of computer peripheral devices and operating system.
Course Outcome	1.Students will understand all the functions and role of Operating system. 2.Students will get aware about techniques like scheduling and memory Management.

Unit	Contents (Theory)	Marks Weightage
I	Introduction of System Programming Introduction to System Program and System Programming, Review of different system programs such as assembler, loaders ,linkers, compilers, interpreters, operating system, device drivers, Elements of assembly level programming Language Processing Activities and Language Processors Development Tools, Assemblers, Design of assembler, Macro definition, Design of Macro preprocessor, Relocating and linking concepts , Design of linker , Programming Environments.	14
II	Compiler Aspects of Compilation, overview of the various phases of compiler , Scanning, Syntax error handling, Symbol table conceptual design Intermediate Code conceptual Design , Intermediate code interfaces, Dynamic storage allocation techniques , Dynamic Programming code generation algorithm ,Principal sources of optimization , Approaches to compiler development. Register allocation techniques. Concurrentisation and vectorisation of programs	14
III	Introduction of OS Introduction to Operating Systems, Types of operating Systems & Services. Basic concepts of CPU scheduling, scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling. Process concept, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization, Disk scheduling.	14

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IV	Deadlock Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling. Concepts of memory management, logical and physical address space, swapping, Fixed and Dynamic Partitions, Best-Fit, First-Fit and Worst Fit Allocation, paging, segmentation, and paging combined with segmentation.	14
V	Virtual Memory Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation, File concepts, File manager, File organization, access methods, allocation methods, free space managements, directory systems, file protection, file organization & access mechanism, file sharing implement issue. Introduction to distributed systems, Design Issues in distributed operating system	14

Text Book/References Books/ Websites

1. Forouzan ;Data Communication & Networking ; IV Edition, TMH.
2. William Stallings ;Data & Computer Communication; Pearson Education
3. Sanjay Sharma; Data Communication and Computer Network ; S.K.Kataria and sons

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100) Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total Nil
MTCS1105	Advance Computer Network	3	1	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/Quiz/ Attendance Max. Marks: Nil

Pre-Requisite	Should have basic knowledge about Internet.
Course Outcome	1.Student will gain all the fundamental knowledge about networking.
	2.Students will be able to understand all the network devices and Protocols.
	3.Students will get knowledge about routing concepts and its protocols.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Introduction to Network models-ISO-OSI, and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.	14
II	Network layer Internet architecture and addressing, internetworking, IPv4, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM. IPv6, Next Generation IP protocol, Wireless Networks, GSM, CDMA, Mobility in networks, Mobile IP, Mobile IP multicasting, BSD Sockets.	14
III	Transport layer: Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model. TCP extensions for high speed network, TCP/IP programming	14
IV	Application layer : Application Layer, File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.	14
V	Network Security: IP Security, Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET), System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems, Study of various network simulators, Network performance analysis using NS2	14

Text Book/References Books/ Websites

1. Forouzan ; TCP/IP Protocol Suite; Tata McGraw Hill
2. Andrew S. Tanenbaum; Computer Networks; PHI
3. Douglas Comer; Internetworking with TCP/IP; Prentice Hall

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (Nil)	Internal (Nil)	Total	External (70)	Internal (30)	Total (100) Min: 40 (D Grade)
MTCS1106	Data Structure and Database Lab	-	-	4	(Nil)	(Nil)	Nil	(70)	(30)	(100)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Sessional – Max Marks: 15	Assignment/Quiz /Attendance Max. Marks: 15

Pre-Requisite	Nil
Course Outcome	1.To learn the basic principles of C++ programming.
	2.Student will be able to learn advanced concepts of database.
	3.Students will be able to learn different Data and its storage.

Unit	Contents (Theory)	Marks Weightage
	Introduction to Data Structures, Classification of Data Structure, Linked List, Stacks, queues, Multiple Stack, Introduction to Relational Databases, Data Models, ER Diagrams, Specialization, Generalization, Aggregation and Association, Integrity Constraints, Types of Data Bases, RDBMS, Query processing. Introduction to SQL.	100

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Experiments :- (Expandable):**

1. Write a program in C++ to search an element in an array using Linear search
2. Write a program in C++ to search the smallest element in an array using Binary search.
3. Write a program in C++ to implement Merge Sort .
4. Write a program in C++ to Implement quick sort..
5. Write a program to implement minimum spanning trees using Krushkal's algorithm.
6. Write a program to implement minimum spanning trees using Prim's algorithm.
7. Write a Program to Implement joins
8. Write a Program to Implement OLAP queries
9. Consider the following relational database schema:
STUDENT (Student_id, Sname, Major, GPA) FACULTY (Faculty_id, fname, dept, designation, salary) COURSE (Course_id, Cname, Faculty_id) ENROL (Course_id, Student_id, grade) Use the above schema and solve the queries using SQL
 - i) List the names of all students enrolled for the courses "CS-53"
 - ii) List the names of students enrolled for the courses "CS-53" and have received "A"

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grade.

iii) List all the departments having an average salary of above Rs20,000.

iv) Give a 15% raise to salary of all faculty.

v) List the names of all faculty members beginning with “R” and ending with letter “U”.

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		L	T	P	External (Nil)	Internal (Nil)	Total	External (70)	Internal (30)	Total (100)
MTCS1107	Operating system and Networking Lab	-	-	4	(Nil)	(Nil)	Nil	(70)	(30)	Min: 40 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Sessional – Max Marks: 15	Assignment/ Quiz/Attendance Max. Marks: 15

Pre-Requisite	Prior knowledge of networking and basic concepts of programming.
Course Outcome	Students will be able to do networking and will be able to do programming based on scheduling ,memory management and other programming concepts.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to Operating Systems, Types of operating Systems & Services. Basic concepts of CPU scheduling, scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling. Process concept, operations on processes. Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Introduction to Network models-ISO-OSI, and TCP/IP models. Review of Physical layer and Data link layers, Network layer Internet architecture and addressing, internetworking, IPv4, ICMP, Routing Protocols,Transport Layer,session Layer,Presentation Layer.	100

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Experiments :- (Expandable):**

1. Study and implementation of routing algorithm
2. Study and implementation of congestion control algorithm.
3. Implementation of subnet mask concept.
4. Simulation of ARP and RARP protocols.
5. Simulation of TCP protocol.
6. Simulation of Data Link Protocol: HDLC
7. Write a program to implement Priority based Scheduling.
8. Write a Program to implement FIFO page replacement algorithm.
9. Write a program to implement Round Robin Algorithm.
10. Write a Program to implement Deadlock Detection Algorithm.

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (35)	Internal (15)	Total (50) Min: 20 (D Grade)	External (Nil)	Internal (Nil)	Total
MT1108	Audit Course - I (Value Education)	2	-	-						Nil

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	<ol style="list-style-type: none"> 1. Knowledge of self-development. 2. Learn the importance of Human values. 3. Developing the overall personality.

Unit	Contents (Theory)	Marks Weightage
I	Values and self-development –Social values and individual attitudes; Work ethics, Indian vision of humanism; Moral and non- moral valuation; Standards and principles; Value judgments.	07
II	Importance of cultivation of values; Sense of duty. Devotion, Self-reliance. Confidence, Concentration; Truthfulness, Cleanliness; Honesty, Humanity; Power of faith, National Unity; Patriotism. Love for nature, Discipline	07
III	Personality and Behavior Development - Soul and Scientific; attitude; Positive Thinking. Integrity and discipline; Punctuality, Love and Kindness; Avoid fault Thinking; Free from anger, Dignity of labour.	07
IV	Universal brotherhood and religious tolerance; True friendship; Happiness Vs suffering, love for truth; Aware of self-destructive habits; Association and Cooperation; Doing best for saving nature.	07
V	Character and Competence –Holy books Vs Blind faith; Self-management and Good health.; Science of reincarnation; Equality, Nonviolence, Humility, Role of Women; All religions and same message; Mind your Mind, Self-control; Honesty, Studying effectively.	07

Mandatory (Non Credit) subject according to AICTE. Non University Examination, End Sem marks not to be included in total marks and credit. Students must pass in this subject.

Text Book/References Books/ Websites

1. S.K. Chakroborty; Values and Ethics organizations Theory and practice; Oxford University Press, New Delhi.

Suggested List of Laboratory Experiments :- (Expandable): Nil