Guru Nanak Dev Engineering College, Ludhiana

Department of Computer Science & Engineering

Scheme and Syllabus

Minor Engineering Degree

in

Computer Science and Engineering

(2018 Batch Onwards)

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Scheme and Syllabus of B.Tech. Minor Degree										
S. No.	**Course Code**	**Course Title**	**Theory/ Practical**	**Hours per Week**			**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
				L	**T**	**P**				
1.	MnPCCS101	Data Structures	Theory	3			40	60	100	3
2.	MnPCCS102	Operating Systems	Theory	3			40	60	100	3
3.	MnPCCS103	Database Management Systems	Theory	3			40	60	100	3
4.	MnPCCS104	Object Oriented Programming	Theory	3			40	60	100	3
5.	MnPCCS105	Computer Networks	Theory	3			40	60	100	3
6.	MnPCCS106	Computer Graphics	Theory	3			40	60	100	3
7.	MnLPCCS101	Data Structures Laboratory	Practical			2	30	20	50	1
8.	MnLPCCS102	Operating Systems Laboratory	Practical			2	30	20	50	1
9.	MnLPCCS103	Database Management Systems Laboratory	Practical			2	30	20	50	1

10.	MnLPCCS104	Object Oriented Programming Laboratory	Practical			2	30	20	50	1
11.	MnLPCCS105	Computer Networks Laboratory	Practical			2	30	20	50	1
12.	MnLPCCS106	Computer Graphics Laboratory	Practical			2	30	20	50	1

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnPCCS101

Subject Name: Data Structures

Programme: B.Tech.(CSE)	**L:** 3 **T:** 0 **P:** 0
Semester: ---	**Teaching Hours:** 37
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 50%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: Knowledge of Programming for Problem Solving and OOPS

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Apply knowledge of statistics and programming skills to solve complex engineering problems related to data structures.
2	Make use of Research based knowledge to identify the appropriate data structure and provide better solution to reduce space and time complexity.
3	Identify, Formulate and analyze data structure to develop skills and understand their applications to perform operations on it.
4	Design appropriate algorithm for autonomous realization of sub-programs to model complex engineering activities.
5	Demonstrate various methods of organizing large amounts of data and recognize systematic way to retrieve data and solve problems.
6	Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.

Detailed Contents:

Part-A

Basic concepts: Concept of data type, Linear and non-linear data structures, Data structures versus data types, Operations on data structures, Algorithm complexity and Asymptotic notations. **[2 Hours]**

Arrays: Linear and multi-dimensional arrays and their representation, Operations on arrays, Sparse matrices and their storage. **[2 Hours]**

Stacks: Sequential representation of stacks, Operations on stacks, Application of stacks – parenthesis checker, Evaluation of postfix expressions, Conversion from infix to postfix, Conversion from infix to prefix representation, Tower of Hanoi problem, implementing recursive functions. **[5 Hours]**

Queues: Sequential representation of queue, Types of queue- Linear Queue, Circular Queue, Deque, Priority Queue, Operations on each types of Queues and their algorithms, Applications of Queues. **[4 Hours]**

Linked List: Definition and representation of Linked list, Types of Linked list- Linear linked list, Doubly linked list, Circular linked list and Header linked list and their operations, Application of linked lists, Garbage collection and compaction, Linked representation of Stack and Queues and their algorithm. **[6 Hours]**

Part-B

Trees: Basic terminology, Sequential and linked representations of trees, Different types of Trees- Binary Tree, Binary search tree, Threaded binary tree, AVL tree and B-tree. Operations on each of the trees. Application of Binary Trees. **[5 Hours]**

Graphs: Basic terminology, Representation of graphs – Adjacency matrix, Adjacency list. Operations on graph, Traversal of a graph – Breadth first search, Depth first search. Shortest path algorithms – Dijkstra's and Floyd. Minimum spanning tree – Prim and Kruskal. Applications of graphs. **[4 Hours]**

Heaps: Representing a heap in memory, Operations on heaps, Application of heap in implementing priority queue and Heap sort algorithm. **[2 Hours]**

Hashing and Hash Tables: Introduction to hash table, Hash functions, Concept of collision and its resolution using open addressing and separate chaining, Double hashing, Rehashing. **[2 Hours]**

Searching and Sorting: Linear and binary search techniques, Sorting methods – Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Shell sort and radix sort. Complexities of searching and sorting algorithms. **[5 Hours]**

Text Books

1. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, Tata McGraw Hill.

2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Tata McGraw Hill.

Reference Books

1. Michael T. Goodrich, Roberto Tamassia, & David Mount, "Data Structures and Algorithms inC++", Wiley India.
2. Kruse, "Data Structures &ProgramDesign", Prentice Hall of India.
3. Y. Langsa, M.J. Augenstein, A.M. Tanenbaum, "Data structures using C and C++", Prentice Hall ofIndia.
4. Vishal Goyal, LaliGoyal, Pawan Kumar, " Simplified Approach to Data Structures", ShroffPublications and Distributors

E-Books and online learning material

1. Data Structures and Algorithms: by Granville Barnett, and Luca Del Tongo. https://apps2.mdp.ac.id/perpustakaan/ebook/Karya%20Umum/Dsa.pdf
2. Data Structures and Algorithms in Java: by Michael T. Goodrich and Roberto Tamassia. http://enos.itcollege.ee/~jpoial/algorithms/GT/Data%20Structures%20and%20Algorithms%20in%20Java%20Fourth%20Edition.pdf

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106102064/
2. https://nptel.ac.in/courses/106106133/
3. https://nptel.ac.in/courses/106106145/
4. https://www.youtube.com/watch?reload=9&v=YWnBbNj_G-U

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnPCCS102

Subject Name: Operating Systems

Programme: B.Tech.(CSE**)**	**L:** 3 **T: 0 P:** 0
Semester:	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 20%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: Basic knowledge of computer fundamentals and computer system architecture.

Additional Material Allowed in ESE:

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the mechanisms of OS to handle processes and threads and their communication.
2	Compare and contrast the mechanisms involved in memory management Techniques
3	Use the components of Operating System in OS design.
4	Evaluate different scheduling Techniques.
5	Investigate basic concepts towards process synchronization and related issues.
6	Understand the structure and organization of file system.

Detailed Contents:

Part - A

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Case study on UNIX and WINDOWS Operating System. **[5 Hours]**

Process management: Concept of processes and threads, Definition, Process and Program, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads. **[4 Hours]**

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling. **[6 Hours]**

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphore. **[4 Hours]**

Part - B

Deadlocks: Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlockprevention and avoidance, Deadlock detection and recovery. **[4 Hours]**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging, Segmentation. **[6 Hours]**

File Management: Concept of File, Access methods, File types, File operation, Directory structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. **[4 Hours]**

Secondary Storage: Disk structure**,** Disk scheduling – FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, Disk Management, Disk Formatting, Boot blocks, Bad blocks. **[4 Hours]**

Text Books

1. A Silberschatz and Peter B. Galvin, "Operating System Concepts" Addison Wesley.
2. GaryNutt, "Operating Systems Concepts", Pearson Education Ltd.

Reference Books

1. Dhamdhere "System Programming and Operating System" Tata McGraw Hill.
2. TanenBaum A. S. "Operating System Design and Implementataion" Pearson Education.
3. Bhatt and Chandra " An Introduction to Operating System Concepts and Practices" Prentice

Hall.

E-Books and online learning material

1. http://www.uobabylon.edu.iq/download/M.S%202013-2014/Operating_System_Concepts,_8th_Edition%5BA4%5D.pdf Accessed on Aug. 05, 2019
2. http://dinus.ac.id/repository/docs/ajar/Operating_System.pdf Accessed on Aug. 05, 2019

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106106144/ Accessed on Aug. 05, 2019
2. https://www.coursera.org/learn/os-power-user Accessed on Aug. 05, 2019

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnPCCS103

Subject Name: Database Management Systems

Programme: B.Tech. (CSE)	**L:** 3 **T:** 0 **P:** 0
Semester:	**Teaching Hours:40**
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** Nil
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: Basic knowledge of computer fundamentals and computer system architecture.

Additional Material Allowed in ESE: not any.

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Analyze the Information Systems as socio-technical systems, its need and advantages as compared to traditional file based systems.
2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
3	Analyze Database design using E-R data model by identifying entities, attributes, relationships, generalization and specialization along with relational algebra.
4	To understand and use data manipulation language to query, update, and manage a database.
5	Apply and create Relational Database Design process with Normalization and De- normalization of data.
6	To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency.

Detailed Contents:

Part-A

Introduction to Database Concepts: Introduction, Database systems versus file systems, Difference between Database and non-database system, Characteristics of Database Approach, Advantages and Disadvantages of Using DBMS. Data base users and administrators, Schemas and

Instances, DBMS Architecture, components of a database system, Data Independence, Database Language and Interfaces, Classification of Database Management Systems. Introduction to NoSQL database. **[5 Hours]**

Entity Relationship Model: Data models, Entity types, Entity sets, Attributes and keys, Relationship types, Relationship sets, Roles and structural constraints, Weak entity types, Design choices for ER conceptual design, Comparison of Models. **[4 Hours]**

Relational Model: Relational model concepts, Constraints, Update operations, Transaction and dealing with constraint violations. Relational Algebra –Unary relational operations, Operations from Set theory, Binary relational operations, DIVISION operation and additional relational operations. Relational Calculus – Tuple relational calculus and Domain relational calculus, Queries related to Relational Algebra and Relational Calculus. **[7 Hours]**

SQL: SQL Data Definition and data types, specifying constraints in SQL, Schema change statements, Basic queries in SQL, Set operations, Aggregate functions and views, Complex queries in SQL, Additional features of SQL. **[7 Hours]**

Part-B

Relational Database Design: Informal design guidelines for Relational Schemas, Functional dependencies, Inference rules for functional dependencies, Equivalence of set of functional dependencies, 2QMinimal cover, Normal forms based on primary keys– (1^{st}NF, 2^{nd}NF, 3^{rd}NF, 4^{th}NFand 5^{th}NF) Decomposition into normalized relations. Physical Database Design – File structures (Sequential files, Indexing, B tree). **[6 Hours]**

Transaction Management and Concurrency Control: Introduction to Transaction Processing, Transaction and System Concepts, need of concurrency control, ACID properties, Schedules, Characterizing schedules based on recoverability and serializability, Two - phase locking techniques for concurrency control. **[4 Hours]**

Database Recovery and Security: Need of recovery, Recovery concepts, Recovery techniques Deferred update, Immediate update, Shadow paging. Database security – Threats to databases, Control measures, Database security and DBA, Discretionary access control based on granting and revoking privileges, Mandatory access control, Introduction to Statistical Database Security,

Encryption and decryption. **[7 Hours]**

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill Education.
2. Ramez Elmasri, Shamkant B Navathe, "Fundamentals of Database Systems", Pearson Education.
3. Connolly, "Specifications of Database Systems: A Practical Approach to Design, Implementationand Management", Pearson India.
4. Alexis Leon, Mathews Leon, "Database Management Systems" Leon Press.
5. S.K. Singh, "Database Systems Concepts, Design and Applications, Pearson Education.
6. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Tata McGrawHill.

Reference Books

1. SQL,PL/SQL ,The programming language of oracle, Ivan Bayross BPB Publication
2. An introduction to database system by C.J.Date (Addison Welsey, Publishing house).
3. An introduction to Database Systems by Bipin C. Desai, Galgotia publications.
4. Prateek Bhatia, Database Management system, Kalayani Publishers

E-Books and online learning material

1. Database Management system. 2nd Ed.

   https://ff.tu-sofia.bg/~bogi/knigi/BD/Database%20Management%20Systems.%202nd%20Ed.pdf

2. Fundamentals of Database Management Systems eBook.

   https://circuitmix.com/free-download-fundamentals-of-database-management-systems-ebook/

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106/106/106106220/ Accessed on Jan22, 2020
2. https://www.youtube.com/watch?v=5TU7zH0Z8 Accessed on Jan 22, 2020
3. https://www.youtube.com/watch?v=Z2Zx2G02aI4 Accessed on Jan 22, 2020

4. https://www.youtube.com/watch?v=Kmp76uRHz9c Accessed on Jan 22, 2020
5. https://www.youtube.com/watch?v=QYd6ZjHpzBg Accessed on Jan 22, 2020

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnPCCS104

Subject Name: Object Oriented Programming

Programme: B.Tech. (CSE)	**L:** 3 **T:** 0 **P:** 0
Semester:	**Teaching Hours:** 40
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 20%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hrs
Total Marks: 100	**Elective Status:** Compulsory

Additional Material Allowed in ESE: [NIL]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Develop an understanding of object oriented programming principles and object oriented design.
2	Use of operators, control structures, and data types with their methods.
3	Make use of arrays and string handling methods.
4	Design user defined functions, modules, and packages.
5	Investigate and implement polymorphism, inheritance, dynamic memory management and exception handling techniques to solve problems.
6	Create and handle files in object oriented programming.

Detailed Contents:

Part-A

Object-Oriented Programming Concepts: Introduction, Comparison between procedural programming paradigm and object-oriented programming paradigm, Features of object-oriented programming: Encapsulation, Class, Object, Abstraction, Data hiding, polymorphism, and

Inheritance. Introduction of object oriented design. **[3 Hours]**

Data Types, Operators, and Control Structures: Basic data types, Derived data types, Keywords, Identifiers, Constants and variables, Type casting, Operators, and Operator precedence. Control Structures: if statement, switch-case, for, while and do-while loops, break and continue statement. **[6 Hours]**

Classes and Objects: Implementation of a class, Creating class objects, Operations on objects, Relationship among objects, Accessing class members, Access specifiers, Constructor and destructor, Types of constructor, Static members, Empty classes, Nested classes, Local classes, Abstract classes, Container classes. **[5 Hours]**

Functions, Arrays, and String Handling: Function components, Default arguments, Passing parameters, Function prototyping, Call by value, Call by reference, Return by reference, Inline functions, Friend functions, Static functions, Recursion, Array declaration, Types of arrays, Array of objects, String handling. **[6 Hours]**

Part-B

Polymorphism and Type Conversion: Introduction, Concept of binding – Early binding and late binding, Virtual functions, Pure virtual functions, Operator Overloading, Rules for overloading operators, Overloading of various operators, Function overloading, Constructor overloading, Type conversion – Basic type to class type, Class type to basic type, Class type to another class type. **[6 Hours]**

Inheritance: Introduction, defining derived classes, Types of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Objects slicing, Overriding member functions, Object composition and delegation. **[5 Hours]**

Dynamic Memory Management using Pointers: Declaring and initializing pointers, Accessing data through pointers, Pointer arithmetic, Memory allocation –Static and Dynamic, Dynamic memory management using new and delete operators, Pointer to an object, this pointer, Pointer related problems – Dangling/wild pointers, Null pointer assignment, Memory leak and Allocation failures. **[5 Hours]**

Exceptions Handling: Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an

exception, Specifying exceptions. **[2 Hours]**

Files Handling: File streams, Hierarchy of file stream classes, Error handling during file operations, Reading/writing of files, Accessing records randomly, Updating files. [**2 Hours]**

Text Books

1. R. Lafore, "Object Oriented Programming in C++", Waite Group.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill.
3. P YashavantKanetkar, "Let Us C++", BPB Publications.
4. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.

Reference Books

1. Herbert Schildt, "The Complete Reference to C++ Language", McGraw Hill-Osborne.
2. B.F.Lippman, "C++ Primer", Addison Wesley.
3. Farrell, "Object Oriented using C++", Cengage Learning.
4. Barbara Liskov, Program Development in Java, Addison-Wesley.

E-Books and online learning material

1. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill. http://www.mldcollege.com/panel/programs/Object%20Oriented%20Programming%20with%20C-Bal%20-%20E.Balagurusamy.pdf

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106101208/1 Accessed on August, 20, 2019
2. https://nptel.ac.in/courses/106101208/18 Accessed on August, 20, 2019
3. https://nptel.ac.in/courses/106101208/20 Accessed on August, 20, 2019
4. https://nptel.ac.in/courses/106101208/21 Accessed on August, 20, 2019
5. https://nptel.ac.in/courses/106101208/23 Accessed on August, 20, 2019

6. https://nptel.ac.in/courses/106101208/25 Accessed on August, 20, 2019

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnPCCS105

Subject Name: Computer Networks

Programme: B.Tech. CSE	**L:** 3 **T:** 0 **P:** 0
Semester:	**Teaching Hours:** 38
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 40%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: Knowledge of Computer System fundamentals.

Additional Material Allowed in ESE: [NIL]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Develop an understanding of modern network architectures from a design and performance.
2	Understand the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3	Analyze various protocols to develop network related applications for future needs.
4	Apply the knowledge of different network designs and various logical models of networking to solve problems of communication over different medium.
5	Utilize knowledge of routing and congestion control algorithms to overcome various issues over different complex networking structures.
6	Discuss algorithms for medium access sub layer to avoid collision and error problems over different types of networks.

Detailed Contents:

Part-A

Data Communication Components: Representation of data and data flow, Various Network

Topologies, Protocols and Standards, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing- Frequency division, Time division and Wave division, Concepts on spread spectrum, OSI model, TCP/IP reference model and their comparison. **[6 Hours]**

Physical Layer: Concept of analog and digital systems, Transmission Media, Transmission impairments and Data rate limits- Nyquist formula, Shannon formula, Switching- Circuit, Message and Packet switching. **[7 Hours]**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction- Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols-Stop and Wait, Go back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols- Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA. **[7 Hours]**

Part-B

Network Layer: Logical addressing- IPV4, IPV6; Address mapping- ARP, RARP, BOOTP and DHCP–Delivery, Routing algorithms, Congestion control policies, Leaky bucket and token bucket algorithms. **[6 Hours]**

Transport Layer: Design issues, Elements of transport Protocols- Connection establishment and release, Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), flow control. **[6 Hours]**

Session, Presentation and Application Layer: Session Layer- Design issue, remote procedure call. Presentation Layer- Design issue, Data compression techniques. Application Layer- Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP. **[6 Hours]**

Text Books

1. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education.
2. Behrouz A. Forouzan, “Data Communication &Networking”, Tata McGraw Hill.

Reference Books

1. Douglas E. Comer, “Internetworking with TCP/IP”, Volume-I, Prentice Hall, India.

2. W. Stallings, "Data and Computer Communication", Prentice Hall of India.

3. James F. Kurose and Keith W. Ross, "Computer Networking", Pearson Education.

E-Books and online learning material

1. An Introduction to Computer Networks by Peter L Dordal, Department of ComputerScience, Loyola University Chicago. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106105081/ Accessed on May. 15, 2019

2. https://nptel.ac.in/courses/106105081/2 Accessed on May. 15, 2019

3. https://nptel.ac.in/courses/106105081/5 Accessed on May. 15, 2019

4. https://nptel.ac.in/courses/106105081/16 Accessed on May. 15, 2019

5. https://nptel.ac.in/courses/106105081/31 Accessed on May. 15, 2019

Subject Code: MnPCCS106

Subject Name: Computer Graphics

Programme: B.Tech. (CSE**)**	**L:** 3 **T: 0 P:** 0
Semester:	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits: 3**
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 25%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: NIL

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1.	Apply the concepts of mathematical foundations and programming to solve diverse problems related to computer graphics.
2.	Compare and contrast various computer graphic algorithms and their suitability to real world problems.
3.	Utilize models for transformation of 2D and 3D objects.
4.	Identify the areas of computer graphics to apply advance algorithmic techniques for changing the formations of geometrical objects.
5.	Apply mathematics and physics in the design and development of graphics applications.
6.	Justify the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

Detailed Contents:

Part A

Introduction: Overview of computer graphics, Computer graphics applications, Different I/O devices with specialized graphics features, Elements of graphics. Graphic systems – Video display devices, Raster scan systems, Random scan systems. Video basics – Video controller, Raster-scan display processor. **[6 Hours]**

2D Primitives: Scan conversion basics, Algorithm for scan converting a point, Scan converting

a line – Digital differential analyser algorithm, Bresenham's line algorithm. Scan converting circle – Bresenham's circle drawing algorithm, Midpoint circle drawing algorithm. Scan converting ellipse– Midpoint ellipse algorithm. Filling Techniques – Scan line polygon fill algorithm, Boundary-fill, Flood-fill. Anti-aliasing. **[6 Hours]**

2-D Transformations: Geometric and coordinate transformations. Geometric transformations – Scaling, Rotation, Translation, Reflection, Shear. Matrix representations, Homogeneous coordinates, Composite transformations. **[6 Hours]**

Part B

2D Viewing and Clipping: The viewing pipeline, Window-to-viewport transformation, Point clipping, Line clipping algorithms – Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Polygon clipping algorithms –Sutherland-Hodgeman, Weiler-Atherton. Curve and text clipping. [**5 Hours]**

3D Transformations and Viewing: 3D geometric transformations – Scaling, Rotation, Translation, Reflection, Shear. Composite transformations, 3D viewing, Viewing pipeline, Parallel projections, perspective projections, classifications of projections. **[5 Hours]**

Visible-Surface Detection: Classification of visible-surface detection algorithms. Techniques for efficient visible-surface algorithms–Back face detection, Depth-buffer method, A-buffer method, Scan-line method, Depth sorting method, BSP tree Method, Area-subdivision method, Octree Methods, Ray-casting method. **[4 Hours]**

Surface Rendering: Light sources, Surface lighting effects, Illumination models, Polygon rendering methods – Constant-intensity shading, Gouraud shading, Phong shading, Fast Phong shading. **[4 Hours]**

Text Books:

1. D. Hearn and M.P. Baker, "Computer Graphics", Second Edition, PHI/Pearson Education.
2. Zhigang Xiang, Roy Plastock, "Theory and Problems of Computer Graphics", Second Edition, Tata McGraw-Hill.
3. C. Foley, Van Dam, Feiner and Hughes, "Computer Graphics Principles & Practice",Second Edition, Pearson Education.
4. Amarendra N. Sinha, Arun D. Udai, "Computer Graphics", First Edition, Tata McGraw-Hill.
5. N. Krishnamurthy, "Introduction to Computer Graphics", First Edition, Tata McGraw-Hill.

Reference Books

1. Malay K. Pakhira, "Computer Graphics, Multimedia and Animation", Second Edition, PHI.
2. Rogers, Adams, "Mathematics Elements for Computer Graphics", Second Edition, Tata Mc-Graw Hill.

E-Books and online learning material

1. Notes for a Computer Graphics Programming Course by Steve Cunningham https://www.cs.csustan.edu/~rsc/NSF/Notes.pdf
2. https://www.tutorialspoint.com/computer_graphics/index.htm
3. https://www.javatpoint.com/computer-graphics-tutorial
4. https://www.geeksforgeeks.org/computer-graphics-2/
5. http://www.svecw.edu.in/Docs%5CCSECGLNotes2013.

Online Courses and Video Lectures

1. https://www.youtube.com/watch?v=fwzYuhduME4 Accessed on Feb 02, 2021
2. https://www.coursera.org/learn/interactive-computer-graphics Accessed on Feb 02, 2021
3. https://www.tutorialspoint.com/computer_graphics Accessed on Feb 02, 2021
4. https://nptel.ac.in/courses/106/106/106106090 Accessed on Feb 02, 2021

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnLPCCS101

Subject Name: Data Structures Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 20
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:**100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of Computers.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Apply Knowledge of mathematics and programming skills to implement and analyze different data structures.
2	Evaluate and analyze the time and space complexity of linear and nonlinear data structures.
3	Design and implement efficient algorithms to solve computing problems in a high level programming language.
4	Utilize knowledge of different data structures to identify and apply the appropriate data structures to solve a real world problem.
5	Compare and analyze different solutions of complex engineering activities with an understanding of their advantages and limitations.
6	Developing an awareness of the data structure for storing data and handling various operations on different applications in the broadest context of technology change.

Special Instruction related to resources requirement: Any programming language like C, C++, canbe used for the programs.

Sr.No.	Name of Practical

1.	Design, Develop and Implement a menu driven Program for the following Array operations a. Creating an Array of N Integer Elements b. Display of Array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position(POS) e. Exit.
2.	Design, Develop and Implement a menu driven Program for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
3.	Design, Develop and Implement a Program for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.
4.	Design, Develop and Implement a Program for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
5.	Design, Develop and Implement a menu driven Program for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE

	d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
6.	Design, Develop and Implement a menu driven Program for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
7.	Design, Develop and Implement a menu driven Program for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue f. Exit
8.	Design, Develop and Implement a Program for the following operationson Singly Circular Linked List (SCLL) with header nodes a. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z)

9.	Design, Develop and Implement a menu driven Program for the following operations on Binary Search Tree (BST) of Integers a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message e. Exit
10.	Design, Develop and Implement a Program for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFSmethod
11.	Write a Program to finds the position of an element in an array using Linear Search Algorithm and Binary search Algorithm.
12.	Write a program to sort list using different sorting algorithms (bubble, selection, insertion, radix, merge and quick sort) and compare them.

Reference Material

Manuals available in Lab.

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnLPCCS102

Subject Name: Operating Systems Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 26
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:**100%
External Marks: 20	**Duration of End Semester Exam (ESE): 2** hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of Computers.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Analyse the services, architectures and principles used in the design of modern operating systems.
2	Execute Linux commands for files and directories, creating and viewing files, File comparisons and Disk related commands.
3	Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine.
4	Demonstrate shell programming by using shell variables and shell keywords forautomated system tasks.
5	Identify the key characteristics of multiple approaches used for the design and development of the operating system.
6	Apply system commands for performing the file manipulation, program execution, and printing text.

Special Instruction related to resources requirement: Any programming language like C, C++,Java can be used to simulate the programs.

Sr.No.	Name of Practical
1.	Installation process of various Operating Systems.

2.	Virtualization, Installation of virtual machine software and installation of Operating System on virtual machine.
3.	Overview of single user systems, network operating system and multiuser system.
4.	Write a program for the simulation of following CPU scheduling algorithms to findturnaround time and waiting time. a) FCFS b) SJF c) Round Robin d) Priority
5.	Write a program for the simulation of producer-consumer problem using semaphores.
6.	Write a program for the simulation of Banker's algorithm for the purpose of deadlock avoidance.
7.	Write a program for the simulation of following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit
8.	Write a program for the simulation of following page replacement algorithms a) FIFO b) LRU c) Optimal
9.	Write a program for the simulation of following disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN
10.	Write a program for the simulation of following file allocation strategies a) Sequential b) Indexed c) Linked

11.	To study the features of Windows and Linux operating system.
12.	Execute various basic Linux commands, commands for files and directories, creating and viewing files, File comparisons, Disk related commands.
13.	Basics of Shell programming, various types of shell, Shell Programming in bash.
14.	Implement conditional statements, looping statement, case statements and functions in Shell programming

Reference Material:

Manuals available in lab.

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnLPCCS103

Subject Name: Database Management Systems Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of Computers.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
2	Design different views of tables for different users and to apply embedded and nested queries.
3	Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.
4	Demonstrate and understand relational algebra in Database which is helpful to design related database software components.
5	Identify the user requirements from a typical business situation, and to document them.
6	Emphasize on team work and developing database applications using modern database tools.

Special Instruction related to resources requirement: MY SQL, SQL Server, Oracle can be used for the queries.

Sr. No.	Name of Practical.
1.	Write the queries for Data Definition (create, drop, alter and rename) and Data

	ManipulationLanguage (select, insert, update and delete).
2	Write SQL queries using logical operators (,=etc).
3.	Write SQL queries using SQL operators (between, and, or, in, like, null).
4.	Write SQL query using character, number, date and group functions.
5.	Write SQL queries for Relational Algebra (union, intersect, and minus, etc).
6.	Write SQL queries for extracting data from more than one table (equi-Join, non-equi-join, outerjoin).
7.	Write SQL queries for sub queries, nested queries.
8.	Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
9.	Queries (along with sub Queries) using any, all, in, exists, not exists, union, intersect, constraints. Example - Select the roll number and name of the student who secured fourth rank in the class.
10.	Queries using aggregate functions (count, sum, avg, max and min), group by, having and creationand dropping of views.
11.	Queries using conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
12.	Write SQL queries to create views and also apply different operations on views.

Minor Project: By using standard database design rules, database has to be designed for a specific assigned problem to a group of two to three students. ER diagram related to project must also be prepared with an open source database tool like MYSQL workbench. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnLPCCS104

Subject Name: Object Oriented Programming Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:**100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Compare and contrast object oriented programming paradigm with procedure oriented programming paradigm.
2	Design and implement efficient programs to solve computing problems in a high level programming language.
3	Utilize knowledge of different object oriented principles to identify and apply the appropriate techniques in problem solving.
4	Apply the knowledge acquired to troubleshoot programming related problems.
5	Utilize the knowledge and principles of object oriented programming while working in multidisciplinary teams.
6	Design and develop projects using object oriented tools and techniques.

Sr. No.	Name of Practical
	[Control statements]

1.	Demonstrate the use of conditional control statements like if, if-else, if-else ladder, nested if-else, and switch-case statement.
2.	Illustrate the use of loop control statements like for, while, and do-while.
3.	Write a program to demonstrate the use of break and continue statement.
	[Arrays and Strings]
4.	Demonstrate the use of one dimensional and two dimensional arrays by using suitable programs.
5.	Illustrate the use of various string handling functions.
	[Classes and Objects]
6.	Program to illustrate the concept of classes and object.
7.	Program to illustrate the concept of nesting of member functions.
8.	Program to show the working of static members (static functions and static variables) in a class.
9.	Program to demonstrate the use of friend functions.
	[Constructors and Destructors]
10.	Program to illustrate the concept of default constructor, parameterized constructor, and copyconstructor.
11.	Program to illustrate the concept of destructors.
	[Polymorphism]
12.	Program to demonstrate the concept of operator overloading
13.	Program to illustrate the concept of function overloading and constructor overloading.
14.	Program to illustrate the concept of virtual functions and pure virtual functions.
	[Inheritance]

15.	Program to illustrate the concept of inheritance.
16.	Program to illustrate the concept of ambiguity in multiple inheritance.
17.	Program to illustrate the order of execution of constructors and destructors in inheritance.
18.	Program to demonstrate the concept of function overriding.
	[Exception handling]
19.	Program to illustrate the exception handling mechanism.
	[File handling]
20.	Program to illustrate the concept of file pointers.
21.	Program to perform read and write operations on a file.

Any one project

Banking System Project

Description: The BANKING SYSTEM project has account class with data members like account number, name, deposit, withdraw amount and type of account. Customer data is stored in a binary file. A customer can deposit and withdraw amount in his account. User can create, modify and delete account.

Library Management System Project

Description: The LIBRARY MANAGEMENT SYSTEM project has book and student class with data members like book no, bookname, authorname. Books record is stored in a binary file. A student can issue book and deposit it within 15 days. Student is allowed to issue only one book. Student Records are stored in binary file. Administrator can add, modify or delete record.

Reference Material

Manuals available in Lab

Scheme and syllabus of Minor Engineering Degree in Computer Science and Engineering

Subject Code: MnLPCCS105

Subject Name: Computer Networks Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 01
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:**100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of Computer System.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Analyze and configure protocols concerning various network technologies over different mediums and layers.
2	Apply the knowledge of different network components, transmission mediums and tools to solve various problems of communication.
3	Design and develop different network design and logical models of networking to solve network related problems.
4	Utilize knowledge of modern network simulation tools to propose solution for efficient working of networks for real world problems.
5	Make use of various troubleshooting methods to overcome networking problems.
6	Function in multidisciplinary teams through groups while working in different network environments with the help of resource sharing.

Special Instruction related to resources requirement: Except practical number 10.

Sr. No.	Name of Practical
1.	Familiarization with networking components, transmission media, tools and devices: LAN Adapters, Hubs, Switches, Routers etc.
2.	Study of various LAN topologies and their creation using network devices, cables and

	computers, Preparing straight and cross cables.
3.	Configuration of TCP/IP Protocols in Windows and Linux.
4.	Implementation of resource (file, printer, etc.) sharing.
5.	Designing and implementing class A, B and C networks.
6.	Subnet planning and its implementation.
7.	To configure dynamic IP address for a computer connected to a LAN.
8.	Use of commands like ping, ipconfig for trouble shooting network related problems.
9.	Develop a program to compute the Hamming Distance between any two code words.
10.	To configure proxy server, Familiarization with network simulation tools.

Reference Material

Manuals available in Lab.

Subject Code: MnLPCCS106

Subject Name: Computer Graphics Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester:	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:**100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of computers and knowledge of any programming language like C/C++.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes(CO)
1	Apply mathematics and logic to develop computer programs for elementary graphic operations.
2	Implement scan conversion problems using a programming language.
3	Outline the concepts of different type of geometric transformation of objects in 2D and 3D.
4	Implement clipping and filling techniques for modifying an object.
5	Gain experience in creating interactive graphics applications using one or more graphics application programming interfaces.
6	Develop scientific and strategic approach to solve complex problems in the domain of computer graphics.

Special Instruction related to resources requirement: Any programming language like C/C++ could be used for the programs.

Sr. No.	Name Of Practical
1.	Write a program for creating a simple two-dimensional shape of any object using lines, circle, etc.
2.	Write a program to Draw a color cube and spin it using transformation matrices.

3.	Implement the DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants).
4.	Write a program to input the line coordinates from the user to generate a line using Bresenham's Algorithm.
5.	Write a program to generate a complete moving wheel using Midpoint circle drawing algorithm and DDA line drawing algorithm.
6.	Write a program to draw an ellipse using the Midpoint ellipse generation algorithm for both the regions.
7.	Write a program to draw any 2-D object and perform the transformations on it according to the input parameters from the user, namely: Translation, Rotation and Scaling.
8.	Write a program to rotate a triangle about any one of its end coordinates.
9.	Write program to draw a house like figure and perform the following operations. a) Scaling about the origin followed by translation. b) Scaling with reference to an arbitrary point.
10.	Write a program to draw a 4×4 chessboard rotated 45˚ with the horizontal axis. Use Bresenham's algorithm to draw all the lines. Use seed fill algorithm to fill black squares of the rotated chessboard.
11.	Write a program to perform clipping on a line against the clip window using any line clipping algorithm. The output must be twofold showing the before clipping and after clipping images.
12.	Write a program to implement the Sutherland-Hodgeman Polygon Clipping algorithm for clipping any polygon.

Reference Material

Manuals available in Lab.