Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Engineering and Managerial Economics	2	1	0	3
2.	DC	BCS-26	Principles of Operating Systems	3	1	2	5
3.	DC	BCS-27	Computer Graphics	3	1	2	5
4.	DC	BCS-28	Design & Analysis of Algorithms	3	1	2	5
5.	DC	BCS-29	Advanced Computer Architecture	3	1	2	5
6.	AC	BEC-42	Digital Signal Processing	3	1	0	-
			Total	**14**	**5**	**8**	**23**

2. Kogent Learning Web Technologies: HTML, JAVA script , Wiley

BCS-26 PRINCIPLES OF OPERATING SYSTEMS

Course Category	:	Department Core (DC)
Pre-requisite Subject	:	NIL

60

Contact Hours/Week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Understand the structure and functions ofOS.
2. Learn about Processes, Threads and Schedulingalgorithms.
3. Understand the principles of concurrency andDeadlocks.
4. Learn various memory managementscheme.
5. Study I/O management and Filesystems.

Topics Covered

UNIT-I

Operating Systems Overview-Components, Goals of Designer, System Structures, User Services, Interrupt Systems and Device Programming-Interrupt Sources and Priorities, Interrupt Service Routines, Hardware Support - Machine States, Context Switching, Privileged Instructions and Registers — 9

UNIT-II

Memory Management-Major Issues: Fetch, Placement, Contiguity, Relocation — 9

States, Context Switching, Privileged
Instructions and Registers

UNIT-II

Memory Management-Major Issues: Fetch, Placement, Contiguity, Relocation Adjustment, Paging and Virtual Memory, Translate-Look-Aside Buffer (Associative Memory), Single and Multi-Level Page Tables, Paging with Segmentation, Problems of Large Address Spaces and How They Are Addressed 9

Virtual Storage Management- Storage Hierarchy, Cache Usage, Partial Residency, Page
Replacement Strategies, Working Sets

UNIT-III

Concurrency Problems and Solutions- Critical Section Problem, Process Synchronization and Coordination, Semaphores, Special Instructions, Monitors, Inter-process Communication, Remote Procedure Calls, Special Problems of Transaction-Based Systems 9

Deadlock and Resource Conflict- Prevention, Avoidance, Detection, Recovery,

Process and Thread Management-Process/Thread Creation and Termination,
Process/Thread States and Their Transitions
CPU Scheduling Algorithms, Non-Preemptive Approaches, Preemptive Approach, Multi-
Processor Considerations

UNIT-IV

Physical Storage Management- Disk Scheduling Algorithms, Disk Performance Features, Disk ReliabilityConcerns 9

File System Organization - The Boot Record - Where Things Start, Directory Organization, File Descriptors, Access ControlBackup

System Security-Principle of Least Privilege, Threats and Vulnerabilities, Protection
Mechanisms - Access and Capability Control, User (Subject) Authentication, Levels of Security in "Trusted" Systems, Confinement Problem

EXPERIMENTS

1. Study of hardware and software requirementsof different operating systems (UNIX,LINUX,WINDOWS XP,WINDOWS7/8
2. Execute various UNIX system calls for
   a. Processmanagement

System Security Principle of Least Privilege, Threats and Vulnerabilities, Protection
Mechanisms - Access and Capability Control, User (Subject) Authentication, Levels of Security in "Trusted" Systems, Confinement Problem

EXPERIMENTS

1. Study of hardware and software requirementsof different operating systems (UNIX,LINUX,WINDOWS XP,WINDOWS7/8
2. Execute various UNIX system calls for
   a. Processmanagement
   b. Filemanagement
   c. Input/output Systemscalls
3. Implement CPU SchedulingPolicies:
   a. SJF
   b. Priority
   c. FCFS
   d. Multi-levelQueue
4. Implement file storage allocationtechnique:
   a. Contiguous(usingarray)
   b. Linked –list(using linked-list)
   c. Indirect allocation(indexing)
5. Implementation of contiguous allocationtechniques:
   a. Worst-Fit
   b. Best-Fit
   c. First-Fit
6. Calculation of external and internalfragmentation
   a. Free space list of blocks fromsystem
   b. List process file from thesystem
7. Implementation of compaction for the continually changing memory layout and calculate total movement ofdata
8. Implementation of resource allocation graphRAG)
9. ImplementationofBanker"salgorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communicationtechniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique-Semaphore

Textbooks

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John
   Wiley & Sons (ASIA) Pvt. Ltd, Seventh Edition, 2005

BCS-27 COMPUTER GRAPHICS

Course Category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Have a basic understanding of the core concepts of computergraphics.
2. Be capable of using OpenGL to create interactive computergraphics.
3. Understand a typical graphicspipeline.
4. Have made pictures with theircomputer.

Topics Covered
UNIT-I

BASICS OF COMPUTER GRAPHICS- Introduction, Area of Computer Graphics, Design and Drawing, Animation Multimedia Applications, Simulation, How are Pictures Actually Stored and Displayed, Difficulties for DisplayingPictures. 9

GRAPHIC DEVICES - Cathode Ray Tube, Quality of Phosphors, CRTs for

BASICS OF COMPUTER GRAPHICS- Introduction, Area of Computer Graphics, Design and Drawing, Animation Multimedia Applications, Simulation, How are Pictures Actually Stored and Displayed, Difficulties for DisplayingPictures. 9

GRAPHIC DEVICES- Cathode Ray Tube, Quality of Phosphors, CRTs for Color Display, Beam Penetration CRT, Shadow - Mask CRT, Direct View Storage Tube, Tablets, Light Pen, Three Dimensional Devices. C Graphics Basics Graphics Programming, Initializing Graphics, C Graphical Functions, Simple Programs.

SIMPLE LINE DRAWING METHODS- Point Plotting Techniques, Qualities of Good Line
DrawingAlgorithms,DigitalDifferentialAnalyzer(DDA),Bresenham"sAlgorithm,Generation of Circles

UNIT-II

TWO DIMENSIONAL TRANSFORMATIONS and CLIPPING AND WINDOWING- 9

What is Transformation?, Matrix Representation of Points, Basic Transformation, Need for Clipping and Windowing, Line Clipping Algorithms, Midpoint Subdivision Method, Other Clipping Methods, Sutherland - Hodgeman Algorithm, Viewing Transformations. **GRAPHICAL INPUT TECHNIQUES-** Graphical Input Techniques, Positioning Techniques, Positional Constraints, Rubber Band Techniques.

EVENT HANDLING AND INPUT FUNCTIONS- Introduction, Polling, Event Queue, Functions for Handling Events, Polling Task Design, Input Functions, Dragging and Fixing, Hit
Detection, OCR.

UNIT-III

THREEDIMENSIONALGRAPHICS-Needfor3- 9
DimensionalImaging,Techniquesfor3-
Dimesional Displaying, Parallel Projections, Perspective Projection, Intensity Cues,Stereoscope
Effect, Kinetic Depth Effect, Shading.

CURVES AND SURFACES- Shape Description Requirements, Parametric Functions, Bezier Methods, Bezier Curves, Bezier Surfaces, B-Spline Methods

UNIT-IV

SOLID AREA SCAN CONVERSION-Three Dimensional Transformations 9
Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, Three Dimensional Transformation, Translations, Scaling, Rotation, Viewing Transformation, Perspective, Algorithms, Three Dimensional Clipping, Perspective View of Cube.

HIDDEN SURFACE REMOVAL-Need For Hidden Surface Removal, Depth - Buffer Algorithm, Properties that Help in Reducing Efforts, Scan Line Coherence Algorithm, Span -
CoherenceAlgorithm,Area-
CoherenceAlgorithms,Warnock"sAlgorithm,PriorityAlgorithms

Functions, Bezier Methods, Bezier Curves, Bezier Surfaces, B-Spline Methods

UNIT-IV

SOLID AREA SCAN CONVERSION-Three Dimensional Transformations 9
Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, Three Dimensional Transformation, Translations, Scaling, Rotation, Viewing Transformation, Perspective, Algorithms, Three Dimensional Clipping, Perspective View of Cube.

HIDDEN SURFACE REMOVAL-Need For Hidden Surface Removal, Depth - Buffer Algorithm, Properties that Help in Reducing Efforts, Scan Line Coherence Algorithm, Span - CoherenceAlgorithm,Area-CoherenceAlgorithms,Warnock"sAlgorithm,PriorityAlgorithms

EXPERIMENTS

Develop program to

1. Understand the basic concepts of computergraphics.
2. Design scan conversion problems using C/C++programming.
3. Apply clipping and filling techniques for modifying anobject.
4. Understand the concepts of different type of geometric transformation of objects in 2D and3D.
5. Understand the practical implementation of modeling, rendering, viewing ofobjects.

Textbooks

1. Z.Xiang,R.Plastock,Schaum"soutlinesComputerGraphics,2nd Ed.,TMH
2. B M Havaldar, C Graphics & Projects, Anmol Publications Pvt. Limited, 01-Jan-2005
3. Hearn and Baker Computer Graphics with OpenGL, 3e, Prentice Hall, 2004.
4. Asthana and Sinha, Computer Graphics for Scientists and Engineers, New Age International, 01-Jan-2007

Reference books

1. Foley, Vandam, Feiner, Hughes, Computer Graphics principles, 2nd Ed.,Pearson Education
2. W. M. Newman, R. F. Sproull, Principles of Interactive computer Graphics, TMH.

BCS-28 DESIGN & ANALYSIS OF ALGORITHMS

Course Category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Define the basic concepts of algorithms and analyze the performance ofalgorithms.
2. Discuss various algorithm design techniques for developingalgorithms.
3. Discuss various searching, sorting and graph traversalalgorithms.
4. Understand NP completeness and identify different NP completeproblems.
5. Discuss various advanced topics onalgorithm

Topics Covered

UNIT-I

Introduction: Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time. Divide And Conquer with Examples such as Sorting, Matrix Multiplication, Convex Hull and Searching. 9

UNIT-II

Greedy Methods with Examples such as Optimal Reliability Allocation, Knapsack, Minimum SpanningTrees–Prim"sandKruskal"sAlgorithms,SingleSourceShortestPaths-Dijkstra"sand Bellman 9

UNIT-II

Greedy Methods with Examples such as Optimal Reliability Allocation, Knapsack, Minimum SpanningTrees–Prim"sandKruskal"sAlgorithms,SingleSourceShortestPaths-Dijkstra"sand Bellman Ford Algorithms. 9

Dynamic Programming with Examples such as Multistage Graphs, Knapsack, All Pair Shortest

Paths-Warshal"sandFloyd"sAlgorithms,ResourceAllocationProblem.

UNIT-III

Backtracking, Branch and Bound with Examples such as Travelling Salesman Problem, Graph Coloring, N-Queen Problem, Hamiltonian Cycles and Sum Of Subsets 9

Advanced Data Structures*:* Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps.

UNIT-IV

Selected Topics: String Matching, Text Processing- Justification of Text, Theory of NP-Completeness, Approximation Algorithms And Randomized Algorithms, Algebraic Computation, Fast FourierTransform. 9

EXPERIMENTS

1. To analyze time complexity of Insertionsort.
2. To analyze time complexity of Quicksort.
3. To analyze time complexity of Mergesort.
4. To Implement Largest CommonSubsequence.
5. To Implement Matrix ChainMultiplication.
6. ToImplementStrassen"smatrixmultiplicationAlgorithm,MergesortandQuicksort.
7. To implement KnapsackProblem.
8. To implement Activity SelectionProblem.
9. ToimplementDijkstra"sAlgorithm.
10. ToimplementWarshall"sAlgorithm.
11. ToimplementBellmanFord"sAlgorithm.
12. To implement Naïve String MatchingAlgorithm.
13. To implement Rabin Karp String MatchingAlgorithm
14. ToimplementPrim"sAlgorithm.
15. To implement Kruskal"sAlgorithm.

Textbooks

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms,
PHI.

BCS-29 ADVANCED COMPUTER ARCHITECTURE

Course Category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voceand One Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Understand the advanced concepts of computerarchitecture.
2. Exposing the major differentials of RISC and CISC architecturalcharacteristics.
3. Investigating modern design structures of Pipelined and Multiprocessorssystems.
4. Become acquainted with recent computer architectures and I/O devices, as well as the low-level language required to drive/manage these types of advancedhardware.
5. Preparing selected reports that imply some emergent topics supporting materialessence.

Topics Covered

UNIT-I

RISC Processors, Characteristics of RISC Processors, RISC vs CISC, Classification of Instruction Set Architectures, Review of Performance Measurements, Basic Parallel Processing Techniques: Instruction Level, Thread Level and Process Level, Classification of Parallel Architectures. 9

UNIT-II

Basic Concepts of Pipelining, Arithmetic Pipelines, Instruction Pipelines, 9

UNIT-II

Basic Concepts of Pipelining, Arithmetic Pipelines, Instruction Pipelines, Hazards in A Pipeline: Structural, Data, and Control Hazards, Overview of Hazard Resolution Techniques, Dynamic Instruction Scheduling, Branch Prediction Techniques, Instruction-Level Parallelism using Software Approaches, Superscalar Techniques, Speculative Execution. 9

UNIT-III

Basic Concept of Hierarchical Memory Organization, Main Memories, Cache Design and Optimization, Virtual Memory Design and Implementation, Memory Protection, Evaluating Memory Hierarchy Performance, RAID, Centralized vs. Distributed Shared Memory. 9

UNIT-IV

Interconnection Topologies, Synchronization, Memory Consistency, Review of Modern Multiprocessors, Distributed Computers, Clusters, Grid, Mainframe Computers, Bus Structures and Standards, Types and Uses of Storage Devices, Interfacing I/O to The Rest of the System, Reliability and Availability, I/O System Design 9

EXPERIMENTS

1. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMDmodel.
2. Write an algorithm and program to perform matrix multiplication of two n * n matrices on Hypercube SIMDModel
3. Write an algorithm and program for Block oriented Matrix Multiplication on multiprocessor system
4. StudyofScalabilityforSingleboardMulti-board,multi-core,multiprocessorusingSimulator
5. Study of various computer Architecture (MIPS, Power etc.) usingsimulator.
6. StudyofMemoryandsystemcontrollers,InterruptandDMAcontrollersusingsimulator.

Textbooks

1. Hennessey and Patterson, Computer Architecture: A quantitative Approach, Morgan Kaufman.
2. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.
3. SIMA, Advanced Computer Architectures, Addison-Wesley.

Reference books

1. H.S. Stone, High-performance Computer Architecture, 3rd edition, Addison-

Quality Management.

UNIT-IV

Material Management: Inventory management, Deterministic and probabilistic models of Inventory control, Material requirements Planning, JIT, ERP, SCM Business process reengineering. 6

Project Management: CPM and PERT, Cost consideration and Crashing

Books & References

1. Joel Dean. Managerial Economics, PHI Ltd., New Delhi.
2. P. Crowson. Economics for Managers, Macmillan, London.
3. Prasanna Chandra.. Financial Management, TMH Pvt. Ltd., New Delhi.

MBA-02 ENGINEERING AND MANEGERIAL ECONOMICS

Course category	:	Management (M)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 2, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will acquire basic knowledge in Engineering & managerial economics, which allows students to gain theoretical and empirical skill of economics.
2. To makeEngineering students prepared for economic empowerment so that they could manage their wealth, help them in starting their own business or during managerial period.
3. Students will develop Interdisciplinary skills which can help them to thrive in the life-long changing environment in various fields of Industry of Economics.
4. Students will acquire practical knowledge of economics, the kind of markets, cost theory, various issues of demand and other major economic concepts.
5. Able to explain succinctly the meaning and definition of managerial economics; elucidate on the characteristics and scope of managerial economics.
6. Able to describe the techniques of managerial economics.
7. Able to explain the applications of managerial economics in various aspects.
8. To learn about the management and economics of the industrial environment

Topics Covered

UNIT-I

Introduction: Meaning, Nature and Scope of micro Economics, Macro Economics and Managerial Economics, Decision making Process with reference to Managerial economics, Managerial Economics and its application in engineering perspective, 6

UNIT-II

Concepts of Demand and Supply: Demand Analysis, Law of Demand, Determinants of Demand, Elasticity of Demand: Price, Income and cross Elasticity. Uses of concept of elasticity of demand in managerial decision 6

Demand Forecasting: Meaning, significance and methods of demand forecasting.
Law of Supply, Determinants and Elasticity of supply

UNIT-III

Production function, Laws of returns to scale & Law of Diminishing returns scale. 6
Overview of cost: fixed cost, variable cost, average cost, marginal cost, Opportunity cost, An overview of Short and Long run cost curves
Profit analysis and concept of profit, Theories of Profits

UNIT-IV

Market Structure: Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions. 6
National Income: Concept and Measurement of National Income. Inflation: Meanig, Types, causes & prevention methods, Business Cycles and Phases

Books & References

1. Mote, Paul and Gupta, Managerial Economics, T M H, New Delhi.
2. H L Ahuja, Managerial Economics, S Chand & Co. New Delhi

BEC-42 **DIGITAL SIGNAL PROCESSING**

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Signals and Systems (BEC-13)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to analyze signals using the Discrete Fourier Transform and Fast Fourier Transform.
2. Able to understand the characteristics of infinite impulse response (IIR) filters and learn designing IIR filters for filtering undesired signals.
3. Able to understand the characteristics of finite impulse response (FIR) filters and learn designing FIR filters for filtering undesired signals.
4. Able to implement digital filters in a variety of forms:-Direct form I & II, Parallel, Cascade and lattice structure.

Topics Covered

UNIT-I 9

Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution

Fast Fourier Transform Algorithms: Introduction, Decimation in Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.

UNIT-II 9

IIR Filter Design: Structures of IIR – Analog filter design – Discrete time IIR filter from analog

filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT-III 9

FIR Filter Design: Filter design using windowing (Rectangular Window, Hamming window,

Hanning window, Blackman window, Kaiser window), Frequency sampling technique.

UNIT-IV 9

Realization of Discrete Time Systems: FIR systems – Direct form, cascaded, parallel and lattice structures**,** IIR systems – Direct form, cascaded, parallel, lattice and lattice ladder structures

Finite Word length Effects: Quantization effect in filter coefficients, round-off effect in digital filters

Books & References

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", PearsonEducation.
2. Oppenheim & Schafer, "Digital Signal Processing"PHI
3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd.,2009.
4. S. Salivahanan, ""Digital Signal Processing" Mc Graw Hill Education