Shri Shankaracharya Technical Campus,

Shri Shankaracharya Group of Institutions

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekananda Technical University Bhilai)

SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech

S.N.	Subject Name	Subject Code	Periods per week			Scheme of Exam			Total Marks	Credit L+(T+P)/2
						Theory/Practical				
			L	T	P	ESE	CT	TA		
1	Advanced Operating System	CS221101	3	1	-	100	20	20	140	4
2	Java Programming and Applications	CS221102	3	1	-	100	20	20	140	4
3	Advanced Computer Architecture	CS221103	3	1	-	100	20	20	140	4
4	Advanced Computer Networks	CS221104	3	1	-	100	20	20	140	4
5	Elective –I Analysis and Design of Algorithms	CS221124	3	1	-	100	20	20	140	4
6	Python Programming and R-Programming Lab	CS221191	-	-	3	75		75	150	2
7	Java Programming and Applications Lab	CS221192	-	-	3	75		75	150	2
Total			**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

Elective – I (Professional Elective)			
S.No.	Board of Study	Subject Code	Subject
1	Computer Science Engineering	CS221121	Advanced Digital Communication
2	Computer Science Engineering	CS221122	Numerical Computing
3	Computer Science Engineering	CS221123	System Simulation
4	Computer Science Engineering	CS221124	Analysis and Design of Algorithms
5	Computer Science Engineering	CS221125	Digital Signal Processing

Subject Code (CS221101)	Advanced Operating System	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total-140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file Systems.	On successful completion of the course, the student will be able to: CO1:- Describe and explain the fundamental components of a computer operating system. CO2:- Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls. CO3:- Define and explain the various aspects of file structure CO4:- Describe and explain the distributed system, topologies and design strategies CO5:- Conceptualize the Knowledge of the advanced operating systems

Unit – I **[CO1, CO2]**

Operating System: Definition, Operating System as Resource Manager.

Types of Operating Systems: Simple Batch Processing, Multi-programmed Batch Processing, Time Sharing, Personal Computer systems, Parallel, Distributed and Real Time Operating Systems.

Operating System Components, Services, Calls, System Programs, Operating System Structure, Virtual Machines, System Design and Implementation.

Process Management: Concepts, Scheduling, Operations, Co-operating processes, Inter-process Communication.

Threads: Thread usage, threads in User Space, threads in Kernel, Hybrid Implementation, Scheduler Activation, Pop-up threads, Multithreading.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Algorithms, Multiple-processor Scheduling, Real Time Scheduling, Algorithm Evaluation. **[15 hours]**

Unit – II **[CO2]**

Process Synchronization: Critical Section Problem, Synchronization Hardware, Semaphores Classical P roblem of synchronization, Critical Regions, Monitors. System Calls like Signal Kill

Deadlock: Characteristics, Necessary Conditions, Prevention, Avoidance, Detection and Recovery.

Memory Management: Logical and Physical Address Space, Swapping

Contiguous Allocation: Single-partitioned, Multi-partitioned.

Non-contiguous Allocation: Paging, Segmentation, and Segmentation with Paging.

Virtual Memory: Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation Over lays. **[13 hours]**

Unit–III **[CO3]**

File and Directory System: File Concepts, Access Methods, Directory Structure, Protection, File system Structure, Allocation Methods, Free Space Management, Directory Implementation, Recovery. Secondary Storage Management: Disk Structure, Dedicated, Shared, Virtual, Sequential Access and Random Access Devices, Disk Scheduling, Disk Management, Swap-space Management, Disk Reliability, Stable Storage Management.
Protection and Security: Threats, Intruders, Accidental Data Loss, Cryptography, User Authentication, Attacks from inside the system, Attacks from outside the system, Protection Mechanism, Trusted Systems, Domain of Protection, Access Matrix, Programs Threats, System Threats. Computer Security Classification. **[11 hours]**

Unit – IV **[CO1, CO4]**

Distributed systems, topology network types, design strategies.
Network operating structure, distributed operating system, remote services, and design issues. Distributed file system: naming and transparency, remote file access, Stateful v/s Stateless Service, File Replication. Basics at Network Operating System, Server Operating System & Real Time Operating System. **[11 hours]**

Unit – V **[CO5, CO1, CO2]**

Distributed co-ordinations: Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, and Reaching Agreement.
Case studies of UNIX and MS-DOS operating system. Advanced Operating System.
[9 hours]

Text Book:

S.No.	Title	Authors	Edition	Publisher
1	Operating System Concepts	Silberschatz and Galvin		Addison-Wesley publishing, Co., 1999
2	Modern Operating Systems	Modern Operating Systems		Pearson Education

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	An Introduction to Operating System	H.M. Dietel		Pearson Education
2	Operating Systems	D. M. Dhamdhere		Tata McGraw-Hill
3	Advanced Concepts in Operating Systems	M. Singhal, N. G. Shivaratri		Tata McGraw -Hill.
4	Operating Systems	William Stallings		Pearson Education

Subject Code (CS221102)	Java Programming and Applications	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students 1. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. 2. Be aware of the important topics and principles of software development. 3. Have the ability to write a computer program to solve specified problems	On successful completion of the course, the student will be able to: **CO1:-** To construct Java programs using features of Object oriented programming. **CO2:-** Able to explain object and package construction process. **CO3:-** To construct robust Java programs using exception handling, multithreading and String class. **CO4:-** To develop java programs using Event Handing and File Handling **CO5:-** To design and develop application programs using UI components and Database connectivity.

UNIT-1 **[CO1]**

Introduction to JAVA

Overview of Java: Object Oriented Programming, feature of java, Concept of Java Virtual Machine (JVM), Java Environment: Java Development Kit, Java Standard Library, Data Types, Variables: Declaring a variable, operators and expression, control statements, conditional statements, loops and iteration, Class definition, adding variables and method, creating objects, constructor, defining method, calling methods, method overriding, creating array: one and two dimension array, string array and methods string and string buffer class, wrapper class. [0**8Hrs.]**

UNIT-2 **[CO2]**

Inheritance: Inheritance basic, Basic Types, method overloading, object reference this and super, Chaining constructor using this () and super (), Multilevel hierarchy abstract and final classes. Interface: Define an interface, implementing interface, implementing interface, variable in interface, Interfaces can be extended. Package: Define package, sub package, importing package. Exception Handling: Fundamentals, Types Checked , Unchecked exceptions, Using try & catch, Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined exception. **[08Hrs.]**

UNIT-3 **[CO3]**

Exception Handling: Fundamentals, Types Checked , Unchecked exceptions, Using try & catch, Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined exception.

Multi-Threading: Java Thread Model, Thread Priorities, Synchronization, Creating a thread, Creating Multiple threads, Using isAlive ( ) and join ( ), wait () & notify ( ). Thread Scheduler, thread class, Run able interface, inter thread communication, deadlock, procedure/consumer problem. String Handling: String constructors, String length, Character Extraction, String Comparison, Modifying a string. **[08Hrs.]**

UNIT-4 **[CO4]**

Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, predefine streams, reading and writing from console and files, using java packages, Serialization. Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, graphics in applet. Event Handing: Delegation Event model, Event Classes, Event Listener Interfaces, Adapter classes. JDBC: Fundamentals, Type I, Type II, Type III, Type IV drivers. **[08Hrs.]**

UNIT-5 **[CO5]**

Networking: Networking fundamentals, client server model, Socket overview, networking classes, & interfaces, TCP/IP client sockets, TCP/IP Server Sockets, URL connection. AWT: Overview of the java.awt package, Component and Containers: Component, Container, Panel, Applet, Window, Frame. Working with Graphics, Handling Events by Extending AWT components, GUI Control Components, Layout Manager, and Introduction to swing: swing overview and its components. Event Handling: Delegation Event model, Event Classes, Event Listener Interfaces, and Adapter classes. **[08Hrs]**

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Java –2 The Complete Reference	Patrick Naughton and Herbertz Schidt	second edition	
2	Programming with Java	E. Balaguruswamy	Second edition	TMH

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Programming with Java	E. Balaguruswamy	Second edition	TMH
2	HTML 4 Unleashed	Rick Dranell	Second edition	Tec media publication
3	Dyanmic web publishing Unleashed	Shelley Powers	Second edition	, Tec media

Subject Code (CS221103)	Advanced Computer Architecture	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students able to understand state of computing, conditions of parallelism and network properties. They learn about Memory and Bus architecture and also know the concept of Parallel and Scalable architecture.	On successful completion of the course, the student will be able to: CO1:- Understand state of computing, conditions of parallelism and network. CO2:- To have thorough knowledge of different types of Processor and Bus architecture CO3:-. They have proper knowledge about Memory Hierarchy and different types of memories CO4:- They are able to understand pipelining and conditions of pipelining CO5:- They have knowledge about parallel and scalable architecture

Unit – I **[CO1, CO4, CO5]**

Parallel Computer and Network Properties:

The state of computing, multiprocessors and multi computers, multivector and SIMD computers, architectural development tracks.

Conditions of parallelism, program partitioning and scheduling, program flow mechanisms. System Interconnect Architectures. Network properties and routing, static inte rconnection networks and dynamic interconnection networks, MPI and PVM architecture. **[12 Hours]**

Unit – II **[CO1, CO2, CO3]**

Processors and Bus Architecture:

Advanced processor technology- CISC, RISC, Superscalar, Vector, VLIW and symbolic processors, Bus System, Bus Architecture, Types of Buses. **[10 Hours]**

Unit – III **[CO2, CO3,]**

Memory Hierarchy, Cache and Shared Memory:

Memory hierarchy technology, Virtual memory technology (Virtual memory models, TLB, paging and segmentation),Cache memory organization, shared memory organization, sequential and weak consistency models. **[14 Hours]**

Unit – IV **[CO1, CO4, CO5]**

Pipelining and Super scalar techniques:

Linear Pipeline Processors, Nonlinear Pipeline processors, Instruction Pipeline Design, Arithmetic Pipeline Design. **[12 Hours]**

Unit- V **[CO1, CO3, CO4, CO5]**

Parallel and Scalable Architecture:

Multiprocessors System Interconnects, Cache Coherence and Synchronization Mechanisms, Vector Processing Principles, Multivector Multiprocessors and Data Flow Architecture, Hybrid Architecture. **[12 Hours]**

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Advanced Computer Architecture	Kai Hwang		McGraw Hill

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Computer Architecture and Organization	J.P.Hayes	Second edition	McGraw Hill
2	Memory Systems and Pipelined Processors	Harvey G. Cragon		Narosa Publication
3	Parallel Computers	V. Rajaranam & C.S.R. Murthy		PHI
4	Foundation of Parallel Processing	R. K. Ghose, Rajan Moona & Phalguni Gupta		Narosa Publications
5	Scalable Parallel Computers Architecture	Kai Hwang and Zu		McGraw Hill

Subject Code (CS221104)	Advanced Computer Networks	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students with an enhanced base of knowledge in current and reflective practice necessary to support a career in Computer Networking at advanced professional level. And to understand the different protocols, software, and network architectures.	On successful completion of the course, the student will be able to: **CO1:-**Students will be able to Understand concept of local area networks, their topologies, protocols and applications of networks. **CO2:-** understand data link layer protocols and its standards. **CO3:-** will understand and able to design routing algorithms. **CO4:-** will understand various security issues. **CO5:-** will understand and develop various network applications.

Unit-I **[CO1]**

Introduction

Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Fundamentals of digital communication, channel capacity, bit error rate, media characteristics, FDM,TDM,CDMA, statistical multiplexing, point to point and broadcast communication, Multicast IPv6 Addressing

Queuing Models

Poisson Process, Markov chain, M/M/1 Queue- delay and little's formula. M/M/S/K Queues – average queue length, delay and waiting times.M/G/1 Queues with numerical

Physics Layers :- Backbone Networks, Virtual LANs Wireless LANs SONE, Frame Relay, ATM IEEE Std. **[8 Hrs.]**

Unit-II **[CO2]**

Data link protocols

Stop and wait protocols and Sliding window protocols - - performance and efficiency. Verification of protocols using Finite State Machines. Multi access protocols – ALOHA and CSMA and its variations. IEEE models and protocols- 802.3,802.4,802.5 and DQDB. Ad hoc networks. **[8 Hrs.]**

Unit-III **[CO3]**

Network layer

Design issues for VC and datagram. Routing algorithms- Dijsktra's , Bellman-Ford, Flooding and broadcasting, link state routing, Flow and congestion control, internetworking, internet architecture and addressing. **[8 Hrs.]**

Unit-IV **[CO4]**

Transport layer

Design issues, Connection management, Elements of TCP/IP protocol, Finite state machine model TCP/UDP

Session and presentation layer

Dialog management, synchronization and session primitives, presentation concepts, cryptography–DES, DES chaining, AES, Public key methods, MD5. Secure Socket layer.

[8 Hrs.]

Unit-V **[CO5]**

Application layer

SNMP, SMTP, RMON, DNS, email se rvice, MIME and WWW, HTTP, FTP, Network Security and Monitoring Telnet

Distributed file systems: file service architecture, Sun network file system, Andrew file system. Distributed shared memory: Design and implementation, sequential consistency.

[8 Hrs.]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Computer Networks	Andrew S. Tanenbaum	fourth edition	Pearson Education
2	Data Networks	Bertsekas and Gallagher	Second Edition	Prentice hall

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Data and Computer Communication	William Stallings	Seventh edition	Prentice hall
2	Cryptography and Network security	William Stallings	Third edition	PHI
3	Data Communications, Computer Networks and Open Systems	Fred Halsall	Fourth edition	Pearson Education
4	Understanding data Communication and Networks	William Shay	Second edition	Thomson press
5	" High speed Networks and Internets" by Pearson education	William Stallings	second edition	Pearson education

ELECTIVE-1

Subject Code (CS221124)	Analysis and Design of Algorithms	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students To study the various ways of analyzing algorithms To understand the need for asymptotic notations, To understand the various algorithm design techniques, To understand string matching algorithms, To learn about NP class of problems and their variations	On successful completion of the course, the student will be able to: **CO1:-**Propose the correct algorithmic strategy to solve any problem **CO2:-** Write algorithms for any problem based on the strategy **CO3:-** Analyze any given algorithm and express its complexity in asymptotic notation **CO4:-**Identify any problem as belonging to the class of P, NP-Complete or NP-Hard **CO5:-** Propose approximation algorithm for any NP problem

Unit –I **[CO1, CO2, CO3]**

Algorithm development for problem solving, Analyzing efficiency of algorithm, Asymptotic growth rates. ADT specification and Design Techniques, Elementary ADTs-Liststrees, Stacks and queues. Recursion and Induction Recursive procedures, Induction proofs, proving Correctness, recurrence relations, recursion trees. **[12 Hours]**

Unit –II **[CO1, CO2, CO3]**

Div ide and Conquer technique of problem solving, sorting algorithms : Quicksort, Mergesort, Merging Sorted sequences, Lower brands for sorting, heap sort, shell sort, radix sort, Dynamic sets and searching : Array doubling, Red Black trees, hashing high, priority queues. **[14 Hours]**

Unit –III **[CO1, CO2, CO3]**

Graphs : Definitions and representations, traversal, DFS and BFS., DFS on undirected graphs. **Greedy algorithms** : Prim's algorithm, single source shortest paths, kruskal's minimal spanning trees, Dijkstra shortest path Transitive closure, APSP problem, Computing transitive closure for matrix operations. **[14 Hours]**

Unit- IV **[CO1, CO2, CO3]**

Dynamic Programming: Sub problem, Graphs and their traversal, Multiplying a sequence of matrices, optimal binary search tree construction, longest common sub sequence. **[12 Hours]**

Unit-V **[CO4, CO5]**

String Matching : Knuth - Moore-Pratt Algorithm, Boyer- Moore Algorithm, P & N P, NP complete algorithms, polynomial time reductions. **[09 Hours]**

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Computer Algorithms, Introduction to Design and Analysis	Sara Baase, Allean Van Gelder	3rd Edition	Pearson Education, Asia

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Introduction to Algorithms	Corman, Leiserson & Rivest		PHI publication
2	Data Structures and Algorithms	Aho		Pearson Education
3	Design & Analysis of Computer Algorithms	Aho		Pearson Education
4	The Art of Programming (Vol I to II)	Knuth		Pearson Education
5	Data Structures and Algorithm Analysis in C	Mark Allen Weiss	second edition	Pearson education

Subject Code (CS221121)	Advanced Digital Communication	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students 1. To understand the key modules of digital communication systems with emphasis on digital modulation techniques. 2. To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.	On successful completion of the course, the student will be able to: CO1 Apply the knowledge of statistical theory of communication and explain the conventional digital communication system. CO2 Apply the knowledge of signals and system and evaluate the performance of digital communication system in the presence of noise. CO3 Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic code. CO4 Describe and analyze the digital communication system with spread spectrum modulation. CO5 Design as well as conduct experiments, analyze and interpret the results to provide valid conclusions for digital modulators and demodulator using hardware components and communication systems.

UNIT – I **[CO1,CO2]**

Digital Modulation: PCM system, Channel Capacity, delta modulation Adaptive digital waveform coding schemes, Matched filter receiver

Coherent Binary: PSK, FSK, QPSK, MSK, DPSK. **[10HRS]**

UNIT- II **[CO2]**

Source coding methods: Review of information theory, Huffman and L-Z encoding algorithm Rate distortion theory for optimum quantization, Scalar vector quantization. **[8HRS]**

UNIT – III **[CO2, CO3]**

Advanced transmission methods: The signal space concept, Gram-Schmitt procedure, signal space representation of modulated signals, nonlinear modulation method with memory, Error probability and optimum receiver for AWGN channel. **[10HRS]**

UNIT – IV **[CO4]**

Advance transmission methods :- Review of channel coding , convolution encoding and decoding, distance properties, viterbi algorithm and Fano algorithm

Trellis coded modulation methods. **[10HRS]**

UNIT – V **[CO4, CO5]**

Spread-spectrum methods:-Study of PN sequences, direct sequences methods, Frequency hop method, digital spread spectrum, slow and fast frequency hop,

Performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA. **[12HRS]**

Text Books:

1. Digital Communication: John G. Prokis (TMG)
2. Digital communication: Simon Haykin (WEP)

Reference Books:

1. Modern communication systems (Principles and application), Leon W. Couch JI(PHI)
Digital communication; Shanmugh

Subject Code (CS221122)	Numerical Computing	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods. This will help you choose, develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess accuracy	On successful completion of the course, the student will be able to: CO1 Solve the basics of Numerical Computation as error analysis, data interpolation, numerical integration, non-linear equations, linear systems. CO2 solve problems of scientific computing.

Unit – I **[CO1]**

Computer arithmetic, binary system, octal and hexadecimal systems, floating point arithmetic, errors, machine computation, computer software.

Solution of transcendental and polynomial equations, direct and iterative methods, bisection, Regula falsi, secant and Newton's method, Muller method, Chebyshev method, multipoint iteration method, order of iterative method and efficiency considerations, Polynomial equations, Birge-Vieta method, Bairstow method, Graeffe's root square method.

[12HRS]

Unit – II **[CO1, CO2]**

System of linear algebraic equations and Eigen value problems, Gaussian elimination and pivo ting, matrix inversion, triangular factorization, iterative methods, Eigen values and Eigen vectors,Power methods.

Interpolation and approximation, Lagrange's and Newton's interpolation, Hermite interpolation, spline interpolation, least square approxima tion, uniform approximation.

[12HRS]

Unit – III **[CO1, CO2]**

Numerical differentiation and integration, Simpson's rule, trapezoidal rule, Romberg integration, Gauss Legendre integration method, double integration. **[08HRS]**

Unit – IV **[CO1, CO2]**

Numerical solution of ordinary differential e quations, Euler method, Taylor series method, Runge-Kutta method, multistep methods, systems of differential equations, higher order ordinary differential equations, boundary value problem. **[10HRS]**

Unit – V **[CO1, CO2]**

Partial differential equations, difference methods, parabolic equations, one space dimension, convergence hyperbolic and elliptic equations. **[08HRS]**

Text Book :

1.V. Rajaraman, ”Computer Oriented Numerical Methods”, PHI, New Delhi.

References:

1. J.H. Mathews," Numerical Methods for Computer science, engineering and Mathematics", PHI
2. M K. Jain, S.R.K. Iyengar and R.K. Jain," Numerical Methods for Scientific and Enginerring Computation", Wiley Eastern Limited, New Delhi, 1985.
3. S.C. Chopra and R.P.Canale, ”Numerical Methods for Engineers”, McGraw-Hill, New York.

Subject Code (CS221123)	System Simulation	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is to provide students 1. The basic system concept and definitions of system; 2. Techniques to model and to simulate various systems; 3. The ability to analyze a system and to make use of the information to improve the performance.	On successful completion of the course, the student will be able to: CO1 Understand the concept of simulation, the fundamental logic, structure, Components, types of simulation models and discrete event simulation CO2 Develop solutions for application problems using manual simulation and Time Advance algorithm on discrete event simulation. CO3 Understand the behavior of a dynamic system and create an analogous model for a dynamic system CO4 Simulate the operation of a dynamic system and make improvement according to the simulation results.

Unit – I **[CO1, CO2]**

System Models: The Concept of a System, System Environment, Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Models, Principles used in Modeling.

System Studies: Subsystems, A Corporate Model, Types of System Study, System Analysis, System Design, System Postulation.

System Simulation: The Technique of Simulation, The Monte Carlo Method, Comparison of Simulation and Analytical Methods, Typesof System Simulation, Numerical Computation Technique of Continuous Models, Numerical Computation Techniques for Discrete Models, Distributed Lag Models, Cobweb Models, The Process of Simulation. **[12HRS]**

Unit-II **[CO2]**

Continuous System Simulation: Continuous System Mo dels, Differential Equations, Analog Computers, Analog Methods, Hybrid Computers, CSMP III, Hybrid Simulation, Feedback Systems, Simulation of an Autopilot.

System Dynamics: Exponential Growth Models, Exponential Decay Models, Logistic Curves,

Generalization of Growth Models, System Dynamics Diagrams, Multi Segment Models, Feedback in Socio-Economic Systems, A Biological Example, World Models, The Dynamo Language.

Probability concepts in Simulation: Stochastic variables, Discrete and continuous probability functions, numerical evaluation, random number generators, discrete distribution generation. **[14HRS]**

Unit-III **[CO2, CO3]**

Introduction To GPSS: GPSS Programs, General Description, Action Times, Succession of Events, Choice of Paths, Simulation of a Manufacturing Shop, Facilities and Storages, Gathering Statistics, Conditional Transfers, Program Control Statements.

GPSS Examples: Priorities and Parameters, SNAs, Functions, Simulation of a Super Market, Transfer Modes, Logic Switches, Testing Conditions, GPSS Model of a Simple Telephone System, Set Operations. **[12HRS]**

Unit-IV **[CO4]**

The Basic Nature of Simulation, When to Simulate? Simulation of a Single Server Queue, Simulation of a Two Server Queue, Simulation of a More General Queue, Simulation of a PERT Network. **[10HRS]**

Unit-V **[CO5]**

Simulation of a general Inventory System, Simulation of an Inventory Policy(P, Q), Simulation of an Inventory System with Buffer Stock, Simulation Languages. **[10HRS]**

Text Book:

1. Geoffrey Gordon, System simulation, Prentice Hall of India.

2. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall of India (EEE)

References :

1. Kishore S.Trivedi, Probability and Statistics with reliability, Queuing and Computer Science Applications, Prentice Hall of India (EEE)
2. Jerry Banks, John S. Carson II, Barry L.Nelson, Discrete Event System Simulation, Prentice Hall of India (EEE) 2nd Ed.

Subject Code (CS221125)	Digital Signal Processing	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	-	ESE Duration
	100	20	20	Total 140	3 Hours

Course Objective	Course Outcomes
The objective is 1. To study about discrete time systems and to learn about FFT algorithms. 2. To study the design techniques for FIR and IIR digital filters 3. To study the finite word length effects in signal processing **4.** To study the properties of random signal, Multirate digital signal processing and about QMF filters.	On successful completion of the course, the student will be able to: CO1 To apply DFT for the analysis of digital signals & systems CO2: To design FIR filters CO2 To design IIR filters CO3 To characterize finite Word length effect on filters CO4 To have a deep understanding on basics of digital signal processing which can be applied to communication systems CO5 To design the Multirate Filters

Unit – I **[CO1,CO2]**

Discrete Signals and Systems: Basic elements of DSP, Classification of discrete time signals, signal representation, Operation on DTS, Classification of discrete time systems (DTS), Representation of arbitrary sequence, Impulse response and convolution sum, Solution of Difference equation using direct method, FIR and IIR systems, Stable and Unstable systems. Frequency response, Transfer function, correlation and Auto correlation.

The Z- Transforms: Z- Transform and ROC of finite and infinite duration sequence, stability and ROC, Properties of ZT, Inverse Z-Transforms (IZT), Solution of differential equation using ZT, Analysis of LTI system. **[16HRS]**

Unit – II **[CO2, CO3]**

Frequency domain representation of Discrete signals: Discrete time Fourier transform (DTFT), Inverse DTFT, Properties of DTFT, Discrete Fourier Transform (DFT), Properties of DFT, IDFT, Twiddle factor, DFT & IDFT using matrix method, circular convolution, Analytical, Graphical and Matrix method for circular convolution, Fast convolution, Fast Fourier transform (FFT), Radix – 2 FFT, DIT-FFT, DIT-IFFT, DIF-FFT, Radix –2 DIF – IFFT, Composite radix FFT, Applications of FFT. **[14HRS]**

Unit – III **[CO1, CO3]**

Implementation of discrete-time systems:

Block diagram and signal flow graph representation of IIR and FIR filters, Realization of IIR filters Direct –I, Direct- II, Cascade, Parallel, Ladder and Transposed Realization), Realization of FIR filters (Direct, Cascade and linear phase FIR structure). Design of digital filter, specification of FIR filters, General consideration, design of FIR filters, Symmetric and antisymemmetric FIR filter, Design of FIR filter using Windows, Frequency sampling method, Hilbert Transformers. **[12HRS]**

Unit – IV **[CO4]**

Filter Design Technique: Design of DTIIR filters. From continuous time filters, Introduction to analog filters for designing Digital filters (Butter worth and chebyshev fi lters), filters design using Impulse invariant, Bilinear Z transform, Matched Z-Transform and Approximation of derivatives methods, frequency transformation, Frequency Transformations, Design of IIR Filters in frequency Domain, Difference between FIR and IIR filters. **[12HRS]**

Unit – V **[CO4,CO5]**

Real time DSP Systems: Real time DSP systems: DSP and its benefits, key DSP operations, Typical Real time DSP system, ADC process, Uniform and Nonuniform quantization and Encoding DAC Process, Signal recovery, sampling of low pass and Band pass signals, Digital signal processors, Evaluation boards for real time signal processing, TMS320C10 forget board, DSP application, Adaptive removal of ocular artifacts from human EEGs: Multirate Digital Signal Processing, Decimation by factor D,Interpolation by factor I, Filter and implementation for sampling rate conversion, multistage implementation of sampling rate convertion, sampling rate conversion of band pass signals, Application of Multirate signal processing. **[14HRS]**

Text Books:

1. Proakis J.G. and D.G. Manolakis, "Digital Signal Processing", Prentice Hall of India, New Delhi, 1999
2. Ifeachor Emmanuel C. and Barrie W. Jervis, "Digital Signal Processing A Practical Approach" Pearson Education Ltd., Fifth Indian Reprint, 2005.

Reference Books:

1. Jonsson Jonny, "Digital Signal Processing", Tata Mc Graw Hill Publication.
2. Schafer R.W. and A.V. Oppehbein, "Digital Signal Processing", Prentice Hall of India, New Delhi, 1999
3. Kue R., "Introduction to Digital Signal Processing", Mc Graw Hill, New York 1988.
4. Porat B., "A course in DSP John Wiley & Sons, Inc., New York, 1997.
5. Bregham E.O., "Fast Fourier Transform" IEEE Spectrum, 1969.
6. Bose N.K. "Digital Filters: Theory & Application" Elsevier, New York, 1995.
7. Hayes Manson H., "Digital Signal Processing", Tata Mc Graw Hill publication.

Subject Code (CS221191)	Python Programming and R-Programming - Lab	L = 0	T = 0	P = 3	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
The objective of this course is to introduce students to the Python programming language.	On successful completion of the course, the student will be able to: CO1:- Define python environment and constructs of Python language and R Programing. CO2:- Explain the various data structures. CO3 Construct scripts in Python language and R Programming.

Experiments to be performed

1. **Python Introduction**:- Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, types. Flow control: if, ifelse, for, while, range() function, continue, pass, break. Strings: Sequence operations, String Methods, Pattern Matching.
2. Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files; Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc), Standard Modules: OS and SYS, The dir() Function, Packages.
3. Input output and file handling, Object Oriented Programming features in Python: Classes, Objects, Inheritance, Operator Overloading, Errors and Exceptions: try, except and else statements, Exception Objects, Regular expressions, Multithreading, Networking: Socket module.
4. **R PROGRAMMING** ¬ Why R Programming is Important? , Why Learn R? , History of R , Features of R , Applications of R , Comparison between R and Python , Which is Better to Choose , Pros and Cons of R , Companies using R , R Packages , Downloading and Installing R , What is CRAN?
5. **Setting R Environment:** Search Packages in R Environment , Search Packages in Machine with inbuilt function and manual searching o,Attach Packages to R Environment , Install Add-on Packages from CRAN , Detach Packages from R Environment , Functions and Packages Help
6. **R Programming IDE** :- RStudio , Downloading and Installing RStudio , Variable Assignment ,Displaying Variables , Deleting Variables , Comments , Single Line , Multi Line Comments . **Data Types** :- Logical , Integer , Double , Complex , Character . **Operators** :- Arithmetic Operators , Relational Operators , Logical Operators , Assignment Operators , R as Calculator , Performing different Calculations .
7. **Functions** :- Inbuilt Functions o User Defined Functions , **STRUCTURES** :- Vector , List , Matrix ,Data frame , Array , Factors . **Inbuilt Constants & Functions** , **Vectors** :- Vector Creation ,Single Element Vector , Multiple Element Vector ,Vector Manipulation , **Lists** :- Creating a List , Naming List Elements , Accessing List Elements , Manipulating List Elements , Merging Lists , Converting List to Vector
8. **Matrix :-** Creating a Matrix , Accessing Elements of a Matrix o Matrix Manipulations o Dimensions of Matrix o Transpose of Matrix

Text books:

1. Mark Lutz.,2009, “Learning Python”,4th ed., O’REILLY Media, Inc..
2. Justin Seitz,2009, “Gray Hat Python: Python Programming with Hackers and Reverse Engineers”, No Starch Press, Inc.

Reference Books:

1. Paul Berry,2011,“Head First Python”. O’REILLY Media, Inc.
2. Jeeva Jose & P. Sojan Lal. 2016. Introduction to Computing & Problem Solving With Python

Subject Code (CS221192)	Java Programming and Applications - Lab	L = 0	T = 0	P = 3	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
The objective is to make the students Make them learn about Java programming concepts, graphical user interfaces, basic data structures.	On successful completion of the course, the student will be able to: **CO1:-** To develop java programs using constructors and destructors. **CO2:-** To utilize the concept of inheritance to develop java programs. **CO3:-** To demonstrate the use of exception handling and Strings in java **CO4:-** To create multithreaded applications using java programming. **CO5:-** To design and develop interactive application programs using user Interfacing components, file handling, and JDBC.

Experiments to be performed

1. Write a program for matrix multiplication. Use Input Stream Reader and Buffered Reader classes for Input/Output.
2. Write a program to create a user defined Exception when the user inputs the marks which exceed more than 100.
3. Write a program to animate a string on Applet. Use the concept of Multithreading.
4. Write a program to design a calculator using the AWT controls provided in Java.
5. Write a program for Client Server communication using either UDP or TCP protocols. Use Server Socket and Socket classes.
6. Write a program to create some of the features of Notepad. Use Swings for designing this application.
7. Create functions like multiply, addition and subtraction respectively. Invoke these functions from remote system by using the concept of Remote Method Invocation in Java.
8. Create a form containing fields name and password respectively, using applet as a container
   The input entered in these fields should be stored in the database .Use
9. JDBC connectivity for implementing this program.
10. Write a program to create a small portal which contains the registration form of students. Use Servlets and JDBC.
11. Write a program create a bean component in Java for addition of two numbers.