# RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

## New Scheme Based On AICTE Flexible Curricula

## CSE-IOT/IOT, IV-Semester

## IO401 Probability, Statistics and Linear Algebra

**Unit 1**: **Basic Probability** - Probability spaces, conditional probability, independence; Discrete random variables, continuous random variable and their properties, distribution functions and densities, exponential and gamma densities. Independent random variables, the multinomial distribution, Chebyshev's Inequality, Bayes' rule.

**Unit 2: Basic Statistics**- Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

**Unit 3: Applied Statistics-** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

**Unit 4:Small samples** - Test for single mean, difference of means and correlation coefficients, test for ratio of variances – Testing of Hypothesis and independence of attributes, Time Series

**Unit 5:Linear Algebra**- Cramer's rule, Singular Value decomposition, Euclidian vector spaces, Projection. Hermitian and Unitary Matrix, Gram -Schmidt orthogonalization, LU- decomposition

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## IO402 Privacy and Security in IoT

**Course Objectives:**
The objective of this course is to make students to learn how cyber security for the IoT works along with key technical details, process flows, definitions of terms and practical examples.

**UNIT I :**
Fundamentals of encryption for cyber security: Cryptography – Need and the Mathematical basics- History of cryptography, symmetric ciphers, block ciphers, DES – AES. Public-key cryptography: RSA, Diffie-Hellman Algorithm, Elliptic Curve Cryptosystems, Algebraic structure, Triple Data Encryption Algorithm (TDEA) Block cipher.

**UNIT II :**
IoT security framework : IOT security frame work, Security in hardware, Bootprocess, OS & Kernel, application, run time environment and containers. Need and methods of Edge Security, Network Security: Internet, Intranet, LAN, Wireless Networks, Wireless cellular networks, Cellular Networks and VOIP.

**UNIT III :**
Elementary blocks of IoT Security & Models for Identity Management: Vulnerability of IoT and elementary blocks of IoT Security, Threat modeling – Key elements. Identity management Models and Identity management in IoT, Approaches using User-centric, Device-centric and Hybrid.

**UNIT IV :**
Identity Management and Trust Establishment: Trust management lifecycle, Identity and Trust, Web of trust models. Establishment: Cryptosystems – Mutual establishment phases – Comparison on security analysis. Identity management framework, Access Control in IoT and light weight cryptography: Capability-based access control schemes, Concepts, identity-based and identity-driven, Light weight cryptography, need and methods, IoT use cases

**UNIT V :**
Security and Digital Identity in Cloud Computing: **S**ecurity, Digital identity management in cloud, Classical solutions, alternative solutions, Management of privacy and personal data in Cloud; Cyber Crimes, Hackers and Forensics: Cyber Crimes and Laws – Hackers – Dealing with the rise tide of Cyber Crimes – Cyber Forensics and incident Response – Network Forensics.

**Reference Books:**
1. John R. Vacca, “Computer and Information Security Handbook”, Elsevier, 2013.
2. Parikshit Narendra Mahalle , Poonam N. Railkar, “Identity Management for Internet of Things”, River Publishers, 2015.
3. William Stallings, “Cryptography and Network security: Principles and Practice”, 5th Edition, 2014, Pearson Education, India.

4. Maryline Laurent, SamiaBouzefrane, “Digital Identity Management”, Elsevier, 2015.
5. Joseph MiggaKizza, “Computer Network Security”, Springer, 2005.
6. Christof Paar and Jan Pelzl, “Understanding Cryptography – A Textbook for Students and Practitioners”, Springer, 2014.
7. Behrouz A.Forouzan : Cryptography & Network Security – The McGraw Hill Company, 2007.
8. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: “Private Communication in a public World”, PTR Prentice Hall, Second Edition, 2002.
9. Alasdair Gilchrist, “IoT security Issues”, Oreilly publications, 2017.

**Course Outcomes:**

On successful completion of this course the students will be able to-

1. Design and implement cryptography algorithms
2. Solve network security problems in various networks
3. Build security systems using elementary blocks
4. Build Trustable cloud based IoT systems
5. Solve IoT security problems using light weight cryptography and appreciate the need for cyber security laws and methods.

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## CSE-IOT/IOT, IV-Semester

## IO403 Operating Systems

**COURSE OUTCOMES:**

**After completing the course student should be able to:**

1. Describe the importance and objectives of an operating system and various services provided by the operating system.
2. Interpret the important functions of different modules of an Operating system, like process management, memory management, device management and file system, etc. and will be able to apply these concepts in given test cases.
3. Compare and contrast different policies of CPU scheduling, Inter-process Communication, Page replacement and disk scheduling algorithms etc.
4. Design and develop small modules, shell and utility programs using system calls of Linux or some educational operating system.

**UNIT 1** **Introduction to Operating Systems**: Function, Evolution, Desirable Characteristics and features of an O/S, Operating Systems Services: Types of Services, Different ways of providing these Services – Utility Programs, System Calls.

**UNIT 2** **Process Management**: Concept of a process, Process State Diagram, Process based kernel, Dual mode of process execution, CPU scheduling algorithms, deterministic modeling, and System calls for Process Management, Concept of Threads: User level & Kernel level Threads. Process Management in UNIX & Windows

**Inter Process Communication**: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, Critical Section Problem, Solution to Critical Section Problem : Semaphores and their Operations and their implementation.Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery. IPC in UNIX & Windows

**UNIT 3** **Memory Management**: Different Memory Management Techniques – Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Techniques for supporting the execution of large programs: Overlay, Dynamic Linking and Loading, Virtual Memory – Concept, Implementation by Demand Paging etc. Memory management in UNIX & Windows

**UNIT 4** **File Systems Management**: File Concept, User's and System Programmer's view of File System, Disk Organization, Tape Organization, Different Modules of a File System, Disk Space Allocation Methods – Contiguous, Linked, Indexed. Directory Structures, File Protection, System Calls for File Management, Disk Scheduling Algorithms. File Systems in UNIX & Windows.

**UNIT 5** **Input / Output Management** : Principles and Programming, Input/Output Problems, Different I/O operations: Program Controlled, Interrupt Driven, Concurrent I/O, Asynchronous Operations, Logical structure of I/O function, I/O Buffering,Kernel I/o Subsystem.Introduction to Network, Distributed and Multiprocessor Operating Systems. I/O management in UNIX & Windows

**TEXT BOOKS RECOMMENDED:**

1. Silberschatz, Galvin, Gagne, "Operating System Concepts'', Wiley,9 Edition.
2. William Stalling, "Operating Systems", PearsonEducation,

**REFERENCE BOOKS:**

1. Andrew S. Tanenbaum, "Modern Operating Systems", 3/e, PrenticeHall
2. Maurice J. Bach, " The Design of Unix Operating System", Prentice Hall of India,
3. Bovet &Cesati, "Understanding the Linux Kernel", O'Reily,2/E.

**List of Experiments :**

1. Write a program to implement FCFS CPU schedulingalgorithm.
2. Write a program to implement SJF CPU schedulingalgorithm.
3. Write a program to implement Priority CPU Schedulingalgorithm.
4. Write a program to implement Round Robin CPU schedulingalgorithm.
5. Write a program to compare various CPU Scheduling Algorithms over different Scheduling Criteria.
6. Write a program to implement classical inter process communication problem (producer consumer).
7. Write a program to implement classical inter process communication problem (Reader Writers).
8. Write a program to implement classical inter process communication problem (Dining Philosophers).
9. Write a program to implement & Compare various page replacementalgorithms.
10. Writeaprogramtoimplement&ComparevariousDisk&Drumschedulingalgorithms
11. Write a program to implement Banker'salgorithms.
12. Write a program to implement Remote ProccedureCall (RPC).
13. Write a Devices Drivers for any Device orperipheral.

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## CSE-IOT/IOT, IV-Semester

### IO404 Computer Organization& Architecture

**Objectives:** Students to be familiarize the basic principles of computer architecture, Design andMulti Processing, Types of data transfer, Concept of semiconductor memories which is useful for research work in field ComputerSystem.

**Unit I: Basic** Structure of Computer:Structure of Desktop Computers, CPU: General Register Organization-Memory Register, Instruction Register, Control Word, Stack Organization, Instruction Format, ALU, I/O System, bus,CPU and Memory Program Counter, Bus Structure, Register Transfer Language-Bus and Memory Transfer, addressing modes. Control Unit Organization: Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch and Execution cycle, Hardwired control unit, Micro- programmed Control unit microprogram sequencer Control Memory, Sequencing and Execution of MicroInstruction.

**Unit II :**Computer Arithmetic**:** Addition and Subtraction, Tools Compliment Representation, Signed Addition and Subtraction, Multiplication and division, Booths Algorithm, Division Operation, Floating Point Arithmetic Operation. design of Arithmeticunit

**Unit III :**I/O Organization: I/O Interface –PCI Bus, SCSI Bus, USB, Data Transfer: Serial, Parallel, Synchronous, Asynchronous Modes of Data Transfer, Direct Memory Access(DMA), I/OProcessor.

**Unit IV :** Memory Organization:Main memory-RAM, ROM, Secondary Memory –Magnetic Tape, Disk, Optical Storage, Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm, Improving Cache Performance, Virtual Memory, memory managementhardware

**Unit V :**Multiprocessors:Characteristics of Multiprocessor, Structure of Multiprocessor-Inter- processor Arbitration, Inter-Processor Communication and Synchronization. Memory in Multiprocessor System, Concept of Pipelining, Vector Processing, Array Processing, RISC And CISC, Study of Multicore Processor –Intel,AMD.

**Reference Books:**


1. Morris Mano , “Computer System Organization”PHI
2. Alan Clements: “Computer Organization and Architecture”, Cengage Learning
3. SubrataGhosal: “Computer Architecture and Organization”,Pearson
4. William stalling ,“Computer Architecture and Organization” PHI
5. M. Usha, T.S. Shrikant: “Computer System Architecture and Organization”, Willey India
6. Chaudhuri, P.Pal: “Computer Organization and Design”,PHI
7. Sarangi: “Computer Organization and Architecture”,Mc-GrawHills

**List of Experiments :**

1. Study of Multiplexer andDemultiplexer
2. Study of Half Adder and Subtractor
3. Study of Full Adder andSubtractor
4. WAP to add two 8 bit numbers and store the result at memory location2000
5. WAP to multiply two 8 bit numbers stored at memory location 2000 and 2001 and stores the result at memory location 2000 and2001.
6. WAP to add two 16-bit numbers. Store the result at memory address starting from 2000.
7. WAP which tests if any bit is '0' in a data byte specified at an address 2000. If it is so, 00 would be stored at address 2001 and if not so then FF should be storedata the same address.
8. Assume that 3 bytes of data are stored at consecutive memory addresses of the data memory starting at 2000. Write a program which loads register C with (2000), i.e. with data contained at memory address2000, D with (2001), E with (2002) and A with (2001).
9. Sixteen bytes of data are specified at consecutive data-memory locations starting at 2000. Write a program which increments the value of all sixteen bytes by01.
10. WAP to add t 10 bytes stored at memory location starting from 3000. Store the result at memory location300A

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## CSE-IOT/IOT, IV-Semester

### IO405 Computer Networks

**Course Outcomes: After completing the course student should be able to:**

- Explain different terminologies of computer network and compare the architecture of networks.
- Evaluate the MAC layer performance.
- Construct and evaluate the existing protocols at the network and transport layer.
- Design and debug the IP networks.

**UNIT 1** Introduction to computer networks & their uses, Different topologies, ISO-OSI model: Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services of OSI layers; The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel, Shennons theorem, Nyquist theorem. Transmission media: Guided and Unguided media, Circuit, Packet and Message switching, virtual Circuit. Introduction to ISDN & its components.

**UNIT 2** The data link layer: Design issues & function, Error detection & correction, Forward error correction Versus Retransmission, Hamming code & CRC codes, Framing: Fixed size and Variable size Frame, Bit stuffing and Byte stuffing. Data link layer protocols: Simplest, Stop and Wait, Sliding window protocols, PPP, SLIP, HDLC. The medium access sublayer: Static and Dynamic Channel Allocation, Protocols: ALOHA Protocol, CSMA (CSMA/CD, CSMA/CA), Collision Free Protocol- Bit Map.

**UNIT 3** IEEE 802 standards for LANs (IEEE 802.3, IEEE 802.4, IEEE 802.5), LAN Devices: HUB, Switches- Learning, Cut-Through and store and forward switches, Bridges: IEEE 802.x to IEEE 802.y, Spanning Tree, Remote Bridge. Internetworking Devices: Routers & gateways. The network layer: Design issues and functions, Internal organization (Virtual Circuit & Datagrams).

**UNIT 4** Routing algorithms: Shortest path routing, Flooding, LSR, Distance Vector Routing, Hierarchical Routing. Introduction to TCP/IP Protocol stack: Protocol Architecture, Classful IP addressing, ARP, RARP, IP Datagrams with options and its delivery, ICMP.

**UNIT 5** Subnet, Supernet, CIDR. Transport Layer: Congestion control, Load Shedding, Jitter control, addressing and multiplexing, Connection establishment and connection release, flow control. Application layer: Introduction to DNS and Email.

**References:**

1.Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.

2 Douglas E Comer, “Internetworking WithTcp/Ip Principles, Protocols, And Architecture - Volume I”
6th Edition,Pearson Education
3.DimitriBertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4.KavehPahlavan, Prashant Krishnamurthy, “Networking Fundamentals”, Wiley Publication.
5.Uyless Black, “Computer Networks”, PHI Publication, Second Edition.
6.Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill.

**List of Experiments:**

1. Study of Different Type of LAN& Network Equipment’s.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to Implement various types of framing methods.
6. Study of Tool Command Language (TCL).
7. Study and Installation of Standard Network Simulator: N.S-2, N.S3.OpNet,QualNetetc .
8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks .
9. Configure 802.11 WLAN.
10. Implement &Simulate various types of routing algorithm.
11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.
12. Study of Application layer protocols-DNS, HTTP, HTTPS, FTP and TelNet.

protocols.

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## CSE-IOT/IOT, IV-Semester

### IO406 Java Lab

**Course Objectives:**

1. Understand fundamentals of programming such as variables, conditional and iterativeexecution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java and be familiar of theimportant concepts like class, inheritance and multithreading, AWT and JDBC.
3. Students will able to use the Java SDK environment to create, debug and run simple Javaprograms.

**Unit 1.**Overview of Java, Installation, First Simple Program, Compilation process, JavaKeywords , Identifiers , Literals, Comments, Data Types, Variables, Dynamic initialization, typeconversion and casting, Operators, Control Statements.

**Unit 2.**Declaring Objects, Introducing Methods, Constructors, this Keyword, GarbageCollection, finalize Method, Overloading Methods, Overloading Constructors, Using Objects asParameters, Inheritance, Creating a Multilevel Hierarchy, Packages and Interfaces, ExceptionHandling, Multithreaded

**Unit 3.**The Applet Class: Applet Basics, The Applet Class, Applet Architecture, AppletInitialization and Termination , Simple Applet Display Methods, Simple Banner Applet, Usingthe Status Window, The HTML APPLET Tag, Passing Parameters to Applets, Improving theBanner Applet.

**Unit 4.**Introducing the AWT: Working with Windows, Graphics, and Text, AWT Classes,Window Fundamentals, Component, Container, Panel, Frame, Working with Frame Windows,Handling Events in a Frame Window, AWT Controls, Layout Managers, and Menus, Addingand Removing Controls, Grid Layout, Border Layout, introduction to swing and servlet.

**Unit 5.**Event Handling, Two Event Handling Mechanisms, The Delegation Event Model,Events, Event Sources, Event Listeners, Event Classes, The Mouse Event Class and others,JDBC: JDBCODBC bridge, the connectivity model, the driver manager, navigating the result setobject contents, the JDBC exceptional classes, connecting to remote database.

**Reference Books:**


1. E. Balagurusamy, “Programming with java A Primer”, McGrawHill.
2. Sharanam Shah, “ Core Java 8 for Beginners”, Shroff Publisher.
3. Naughton&Schildt, “The Complete Reference Java 2”, Tata McGraw Hill.
4. Horstmann& Cornell, “Core Java 2” (Vol I &II ), Pearson.


**List of Experiments:**

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two number using prototyping of methods.
3. Program to demonstrate function overloading for calculation of average.
4. Program to demonstrating overloaded constructor for calculating box volume.
5. Program to show the detail of students using concept of inheritance.
6. Program to demonstrate package concept.
7. Program to demonstrate implementation of an interface which contains two methodsdeclaration square and cube.
8. Program to demonstrate exception handling in case of division by zero error.
9. Program to demonstrate multithreading.

10. Program to demonstrate JDBC concept using create a GUI based application for student information.
11. Program to display “Hello World” in web browser using applet.
12. Program to add user controls to applets.
13. Write a program to create an application using concept of swing.
14. Program to demonstrate student registration functionality using servlets with session management.