

| <b>Bachelor of Technology (Computer Science &amp; Engineering)</b> |                    |                                |              |                    |                |                                     |                   |                  |              |                               |
|--|--------------------|--------------------------------|--------------|--------------------|----------------|-------------------------------------|-------------------|------------------|--------------|-------------------------------|
| <b>Credit-Based Scheme of Studies/Examination</b>                  |                    |                                |              |                    |                |                                     |                   |                  |              |                               |
| <b>Semester VI (w.e.f. session 2020-2021 )</b>                     |                    |                                |              |                    |                |                                     |                   |                  |              |                               |
| <b>S. No.</b>  | <b>Course Code</b> | <b>Subject</b>                 | <b>L:T:P</b> | <b>Hours /Week</b> | <b>Credits</b> | <b>Examination Schedule (Marks)</b> |                   |                  |              | <b>Duration of Exam (Hrs)</b> |
|  |                    |                                |              |                    |                | <b>Major Test</b>                   | <b>Minor Test</b> | <b>Practical</b> | <b>Total</b> |                               |
| 1  | PC-CS-302          | Compiler Design                | 3:0:0        | 3                  | 3              | 75                                  | 25                | 0                | 100          | 3                             |
| 2  | PC-CS-304          | Computer Networks              | 3:0:0        | 3                  | 3              | 75                                  | 25                | 0                | 100          | 3                             |
| 3  | PEC                | Elective-II                    | 3:0:0        | 3                  | 3              | 75                                  | 25                | 0                | 100          | 3                             |
| 4  | PEC                | Elective-III                   | 3:0:0        | 3                  | 3              | 75                                  | 25                | 0                | 100          | 3                             |
| 5  | OEC                | Open Elective-I                | 3:0:0        | 3                  | 3              | 75                                  | 25                | 0                | 100          | 3                             |
| 6  | PROJ – CS-302      | Project-1                      | 0:0:6        | 6                  | 3              | 0                                   | 40                | 60               | 100          | 3                             |
| 7  | PC-CS-306L         | UNIX and Linux Programming Lab | 0:0:4        | 4                  | 2              | 0                                   | 40                | 60               | 100          | 3                             |
| 8  | PC-CS-308L         | Computer Networks Lab          | 0:0:4        | 4                  | 2              | 0                                   | 40                | 60               | 100          | 3                             |
| <b>Total</b>   |                    |                                |              | <b>29</b>          | <b>22</b>      | <b>375</b>                          | <b>245</b>        | <b>180</b>       | <b>800</b>   |                               |

| <b>PEC Elective-II</b>                                 | <b>PEC Elective-III</b>              |
|--|--------------------------------------|
| Advanced Computer Architecture: PE-CS-S302             | Simulation & Modeling: PE-CS-S310    |
| Distributed Systems: PE-CS-S304                        | Mobile Computing: PE-CS-S312         |
| Fault Tolerant Computing: PE-CS-S306                   | Unix & Linux Programming: PE-CS-S314 |
| Mobile Ad-hoc and Wireless Sensor Networks: PE-CS-S308 | Real Time Systems: PE-CS-S316        |
| <b>OEC Open Elective-I</b>                             |                                      |
| Soft Skills and Interpersonal Communication: OE-CS-302 |                                      |
| Management Information System: OE-CS-304               |                                      |
| Enterprise Resource Planning: OE-CS-306                |                                      |

**Note:** Students be encouraged to go to 6-8 weeks summer internships mandatory during the summer break after the completion of sixth semester exams.

The course of both PE & OE will be offered at 1/3<sup>rd</sup> strength or 20 students (whichever is smaller) of the section.

| PC-CS-302           | Compiler Design   |           |        |            |            |       |        |
|---------------------|---|-----------|--------|------------|------------|-------|--------|
| Lecture             | Tutorial  | Practical | Credit | Major Test | Minor Test | Total | Time   |
| 3                   | 0   | 0         | 3      | 75         | 25         | 100   | 3 Hrs. |
| Purpose             | To introduce compiler design concepts and their implementation                |           |        |            |            |       |        |
| Course Outcomes(CO) |   |           |        |            |            |       |        |
| CO1                 | To understand the role and designing of a lexical analyzer.                   |           |        |            |            |       |        |
| CO2                 | To analyze the role and designing of syntax analyzer or parser.               |           |        |            |            |       |        |
| CO3                 | To identify the role of semantic analyzer and intermediate code generation.   |           |        |            |            |       |        |
| CO4                 | To explore the design importance of optimization of codes and error detection |           |        |            |            |       |        |

### UNIT I

Introduction to Language Processing System, Compiling Analysis of the Source Program, Phases of a Compiler, Compiler Construction Tools. Lexical Analysis –Regular Expression, Introduction to Finite Automata and Regular Expression, Conversion of Regular Expression to NFA, Role of Lexical Analyzer, Specification of Tokens.

### UNIT II

Syntax Analysis: Role of the Parser, Abstract Syntax Trees, Ambiguity in Context-Free Grammars, Types of Parsing:- Top Down Parsing, Recursive Descent Parsing, LL Parser, Back Tracking, Bottom Up Parsing, SLR Parser, Canonical LR Parser, LALR Parser.

### UNIT III

Semantic Analysis : Semantic Errors, Attribute Grammar, Synthesized attributes, Static Allocation, Stack Allocation, Heap Allocation, Activation Trees, Symbol Table, Intermediate Code Generation and Code Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, DAG representation of Basic Blocks, A simple Code generator from DAG, Issues in the Design of Code Generator

### UNIT IV

Code Optimization and Run Time Environments, Principal Sources of Optimization, Machine-independent Optimization, Machine-dependent Optimization, Optimization of Basic Blocks, Loop Optimization , Peephole Optimization, Introduction to Global Data Flow Analysis, Storage Organization, Static Storage Management, Heap Storage management, Parameter Passing, Error Recovery, Panic mode, Statement mode, Global correction.

### Suggested Book :

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia, 2018.
2. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003.
3. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003.
4. V Raghavan , “ Principles of Compiler Design”, Second Edition, Tata McGraw-Hill, 2018.
5. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
6. Kenneth C. Loudon, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003

| PC-CS-304           | Computer Networks   |           |        |            |            |       |        |
|---------------------|---|-----------|--------|------------|------------|-------|--------|
| Lecture             | Tutorial  | Practical | Credit | Major Test | Minor Test | Total | Time   |
| 3                   | 0   | 0         | 3      | 75         | 25         | 100   | 3 Hrs. |
| Purpose             | To introduce the architecture and layers of computer network, protocols used at different Layers.     |           |        |            |            |       |        |
| Course Outcomes(CO) |   |           |        |            |            |       |        |
| CO1                 | To understand the basic concept of networking, types, networking topologies and layered architecture. |           |        |            |            |       |        |
| CO2                 | To understand data link layer and MAC sub-layer`  |           |        |            |            |       |        |
| CO3                 | To understand the network Layer functioning   |           |        |            |            |       |        |
| CO4                 | To understand the transport layer and application layer operation                                     |           |        |            |            |       |        |

### Unit -I

**Introduction to Computer Networks :** Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and Wired networks, broadcast and point-to-point networks, Network topologies, protocols, interfaces and services, ISO- OSI reference model, TCP/IP architecture.

**Physical Layer:** Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Multiplexing : Frequency Division, Time Division, Wavelength Division, Transmission Media : Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching ,Packet Switching & comparisons, narrowband ISDN, broadband ISDN.

### Unit -II

**Data link layer:** Error Control, Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, sliding window protocols, Selective repeat ARQ, HDLC;

**Medium access sub layer:** Point to point protocol, FDDI, token bus, token ring; Reservation, polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA, LLC, Traditional Ethernet, fast Ethernet, Network devices-repeaters, hubs, switches, Bridges, Router, Gateway .

### Unit-III

**Network layer:** Addressing : Internet address, sub-netting; Routing techniques, static vs. dynamic routing , routing table, DHCP, IEEE standards 802.x, Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IGMP, IPV6; Unicast and multicast routing protocols, ATM.

### Unit-IV

**Transport layer:** Process to process delivery; UDP; TCP, RPC, Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS.

**Application layer:** DNS; SMTP, SNMP, FTP, HTTP & WWW; Firewalls, Bluetooth, Email, S/MIME, IMAP,

**Network Security:** Cryptography, user authentication, security protocols in internet, public key encryption algorithm, digital signatures

#### Suggested Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw Hill, Fourth Edition, 2011.
2. Computer Networks, 4th Edition, Pearson Education by Andrew S. Tanenbaum
1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition,Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

| PC-CS-306L          | UNIX and Linux Programming Lab   |           |        |            |           |       |        |
|---------------------|--|-----------|--------|------------|-----------|-------|--------|
| Lecture             | Tutorial   | Practical | Credit | Minor Test | Practical | Total | Time   |
| 0                   | 0  | 4         | 3.0    | 40         | 60        | 100   | 3 Hrs. |
| Purpose             | Experimental knowledge of programming skills with expertisation on Unix/Linux platform                                     |           |        |            |           |       |        |
| Course Outcomes(CO) |  |           |        |            |           |       |        |
| CO1                 | Learning of simple and advanced commands of Unix /Linux operating systems.   |           |        |            |           |       |        |
| CO2                 | Develop shell programming using Bash or any other shell scripts.   |           |        |            |           |       |        |
| CO3                 | Develop advanced shell programming skills.   |           |        |            |           |       |        |
| CO4                 | Analyzing & evaluation of performance of various c language based programs with the help of Make file & debug utilities.   |           |        |            |           |       |        |
| CO5                 | Creation of user accounts, Learning of package installation, backup and shutdown process on Unix /Linux operating systems. |           |        |            |           |       |        |

#### **List of Practical**

1. Familiarize with Unix/Linux Log In/Log Out and various other commands & vi editor.
2. Develop simple shell programs using Bash or any other shell in Linux.
3. Develop advanced shell programs using grep, fgrep & egrep.
4. Compile and debug various C language based programs using 'makefile' & 'debug' utility.
5. Learning of installation of dual operating systems with Linux having previously installed other window based operating system. Both OSs should be in working operating mode.
6. As Supervisor create and maintain user accounts, learn package installation, taking backups, creation of scripts for file and user management, creation of startup and shutdown scripts using at, batch, cron etc.

**NOTE : At least 8 to 12 more programs exercises based on Unix/Linux platform are to be assigned by the concerned teacher.**

| PC-CS-308L           | Computer Networks Lab  |           |        |            |           |       |        |
|----------------------|--|-----------|--------|------------|-----------|-------|--------|
| Lecture              | Tutorial   | Practical | Credit | Minor Test | Practical | Total | Time   |
| 0                    | 0  | 4         | 2      | 40         | 60        | 100   | 3 Hour |
| Purpose              | To explore networking concepts using Java programming & networking tools.    |           |        |            |           |       |        |
| Course Outcomes (CO) |  |           |        |            |           |       |        |
| CO1                  | Do Problem Solving using algorithms.   |           |        |            |           |       |        |
| CO2                  | Design and test simple programs to implement networking concepts using Java. |           |        |            |           |       |        |
| CO3                  | Document artifacts using applied addressing & quality standards.             |           |        |            |           |       |        |
| CO4                  | Design simple data transmission using networking concepts and implement.     |           |        |            |           |       |        |

### **COMPUTER NETWORKS LAB**

1. Create a socket for HTTP for web page upload and download.
2. Write a code simulating ARP /RARP protocols.
3. Study of TCP/UDP performance.
4. Performance comparison of MAC protocols
5. Performance comparison of routing protocols.
6. Write a program:
  - a. To implement echo server and client in java using TCP sockets.
  - b. To implement date server and client in java using TCP sockets.
  - c. To implement a chat server and client in java using TCP sockets.
7. Write a program:
  - a. To implement echo server and client in java using UDP sockets
  - b. To implement a chat server and client in java using UDP sockets.
  - c. To implement a DNS server and client in java using UDP sockets.
8. To flood the server from a spoofed source address leading to a DoS attack.
9. To sniff and parse packets that pass through using raw sockets.
10. To implement simple calculator and invoke arithmetic operations from a remote client.
11. To implement bubble sort and sort data using a remote client.
12. To simulate a sliding window protocol that uses Go Back N ARQ.

| PE-CS-S308  | Mobile Ad-hoc and Wireless Sensor Networks  |           |        |            |            |       |        |
|---|---|-----------|--------|------------|------------|-------|--------|
| Lecture   | Tutorial  | Practical | Credit | Major Test | Minor Test | Total | Time   |
| 3   | 0   | 0         | 3      | 75         | 25         | 100   | 3 Hrs. |
| Program Objective (PO)                              | To enable students to describe and deal with computer communication and networking, various reference models and architectures along with implemented wireless communication techniques and various security and privacy parameters are also studied. |           |        |            |            |       |        |
| Course Outcomes (CO)                                |   |           |        |            |            |       |        |
| After completion of course students will be able to |   |           |        |            |            |       |        |
| CO1   | Classify traditional networks and discuss various wireless networking standards, compare and contrast various IEEE wireless LAN and Ethernet standards.   |           |        |            |            |       |        |
| CO2   | Describe cellular architecture and IPv4 and IPv6 header formats has to be discussed along with mobile IP.   |           |        |            |            |       |        |
| CO3   | Recently deployed high performance computing standards, VPN, routing protocols as to be gone through.   |           |        |            |            |       |        |
| CO4   | Various security and privacy standards/tools to be described.   |           |        |            |            |       |        |

### Unit I

**Introduction to Mobile Ad hoc Networks (MANET)** – Mobility Management, Characteristics and Attributes related to MANETs, Modeling distributed applications for MANET, MAC mechanisms and protocols.

### Unit II

**MANET Routing Protocols:** Ad hoc network routing protocols, destination sequenced distance vector algorithm, cluster based gateway switch routing, global state routing, fish-eye state routing, dynamic source routing, ad hoc on-demand routing, OLSR & TORA routing, location aided routing, zonal routing algorithm.

### Unit III

**Ad-Hoc Network Security:** Link layer, Network layer, Trust and key management. Self policing MANET – Node Misbehaviour, secure routing, reputation systems.

**Wireless Sensor Networks (WSN) :** Design Issues, Clustering, Applications of WSN.

### Unit IV

**MAC layer and Routing Protocols in WSN**

**Data Management:** Retrieval Techniques in WSN, Sensor databases, distributed query processing, Data dissemination and aggregation schemes, Operating Systems for WSN, Security issues in WSN.

### Suggested Books:

- 1 C. Siva Ram Murthy & B.S. Manoj, Mobile Ad hoc Networks – Architectures & Protocols, Pearson Education, New Delhi, 2004
- 2 C M Cordeiro& D.P. Agrawal, Adhoc & Sensor Networks – Theory and Applications, ISBN 981256-682-1, World Scientific Singapore, 2006
- 3 C. S. Raghvendra, Wireless Sensor Networks, Springer-Verlag, 2006.

| PE-CS-S314          | UNIX and Linux Programming   |           |        |            |            |       |        |
|---------------------|--|-----------|--------|------------|------------|-------|--------|
| Lecture             | Tutorial   | Practical | Credit | Major Test | Minor Test | Total | Time   |
| 3                   | 0  | 0         | 3      | 75         | 25         | 100   | 3 Hrs. |
| Purpose             | Expertisation in computational programming skills on Unix/Linux Environment.                             |           |        |            |            |       |        |
| Course Outcomes(CO) |  |           |        |            |            |       |        |
| CO1                 | Learning of simple & advanced commands with features and characteristics of Unix /Linux Systems.         |           |        |            |            |       |        |
| CO2                 | Exploring knowledge of programming development skills using Shell, Filters, editors and other utilities. |           |        |            |            |       |        |
| CO3                 | Analyzing the programming behaviour based on programming development/management on Unix /Linux Systems.  |           |        |            |            |       |        |
| CO4                 | Developing creativity as system administrative with networking expertisation in Unix /Linux Systems.     |           |        |            |            |       |        |

### UNIT I : Unix/Linux Commands with Usages

History of Unix, Structure of Unix System & its environment, Unix/Linux Startup, User accounts, accessing Linux – starting and shutting processes, Logging in and Logging out, various types of Unix Commands, zip, unzip, compress, uncompress, pack, unpack, various types of shells, shell programming, Unix file system, Mounting & Unmounting File System, Linux/Unix files, i-nodes, files system related commands, shell as command processor, shell variables, scripting, Unix architecture, Handling ordinary files, General purpose utilities and advanced Unix Commands.

### UNIT II : Filters and File Compression

Regular Expression and Filters : Introducing regular expression patterns, syntax, character classes, Quantifiers, Bourne Shell Programming, shell scripting, grep : searching pattern, egrep : searching extended regular expression, Editors in Unix/Linux : Stream Editor, Visual Editor, Emacs Editor, programming with AWK and PERL, File compression techniques, delta compression, parallel compression with Xdelta utility, data similarities elimination for data reduction.

### UNIT III : Program Development Tools

The C Environment : C language programming in Unix/Linux using vi editor & C compiler, various modes of vi editor, C compiler options, C Shell operators, C Shell Script & programming, Program Development Tools, MakeFile Utility for keeping program up-to-date & its use for dependency calculations, dynamic linking and loading of libraries modules, static and shared libraries, dynamic loader, debugging tools like gdb for handling errors, Memory management and managing large projects in Unix programming environment.

### UNIT IV : System Administration and Networking

Processes in Linux : Processes, starting and stopping processes, initialization of processes, rc and init files, job control – at, batch, cron, time, network files, security, authentication, password administration, signals handlers, threading, Linux I/O system, Networking tools : Ping, Telnet, FTP, Router, Firewalls, Backup and Restore tar, cpio, dd utility, mail command, Unix Network Security.

Case Study : LINUX Operating System as open source free software.

### Suggested Books :

1. Sumitbha Das : Unix – Concept and Applications, Fourth Edition TMH, 2015
2. B.M Harwani, Unix and Shell Programming, Oxford University Press, 2013
3. Neil Matthew, Richard Stones : Beginning Linux Programming, 4<sup>th</sup>. Edition, Wrox-Shroff, 2011.
4. Welsh & Kaufmann : Running Linux, O' Reiley & Associates, 2013.

| OE-CS-302            | Soft Skills & Interpersonal Communication                |           |        |            |            |       |       |
|----------------------|--|-----------|--------|------------|------------|-------|-------|
| Lecture              | Tutorial   | Practical | Credit | Major Test | Minor Test | Total | Time  |
| 3                    | 0  | 0         | 3      | 75         | 25         | 100   | 3Hrs. |
| Course Outcomes (CO) |  |           |        |            |            |       |       |
| CO1                  | Develop basic understanding of Communication.            |           |        |            |            |       |       |
| CO2                  | Understand the process of communication and speaking.    |           |        |            |            |       |       |
| CO3                  | Develop the Personality concepts and its implementation. |           |        |            |            |       |       |
| CO4                  | Develop the basic of group Discussion and interview.     |           |        |            |            |       |       |

### UNIT-I

**Communication:** Introduction Verbal, Types of communication, extra personal communication, inter personal communication, intrapersonal communication, mass communication, Creativity in communication, Role of communication, flow of Communications and its need, Speaking Skills, Main features of speaking skills.

### UNIT-II

Barriers in the way of communication, noise, inter personal barriers, intrapersonal barriers, organizational barriers, Extra personal barriers, **Basics of communication:** importance of communication, process of communication, objectives and characteristics of communication.

### UNIT-III

Personality Development, what is personality? Role of personality, Heredity, Environment, situation, Basics of personality, **Soft skills:** Need and training. Activity in soft skills, **Organizational skill:** introduction and its need, basics principles for organization skills.

### UNIT-IV

**Group discussion:** Group discussion, form of group discussion, strategy for group discussion, discussing problem and solution, Oral presentation, introduction, planning, Occasion, purpose, Modes of delivery, **Resume making:** Purpose of Resume, Resume design and structure, contents in Resume, types of Resume, job interview, introduction, objective of Interview, types of interview, stages of interview, Face to face interview and campus interview.

### Suggested Books:

1. Technical Communication Principles and Practice by Meenakshi Raman and Sangeeta Sharma by Oxford Publication.
2. Personality Development and soft skills by Barun K. Mitra ,Oxford Publication.
3. Communication Skills For Engineers by C. Muralikrishna and Sunita Mishra , Pearson Pub.