OPEN ELECTIVES
OFFERED BY
THE DEPARTMENT OF
COMPUTER SCIENCE AND
ENGINEERING

LIST OF OPEN ELECTIVES

S.No.	Course Code	Course Title	L	P	Credits
1	CSE010	Basic Computer Applications	1	2	02
2	CSE011	C Programming Basics	1	2	02
3	CSE012	Computer Fundamentals	1	2	02
4	CSE013	Cyber Security Essentials	2	0	02
5	CSE014	Data Science Basics	2	0	02
6	CSE015	Introduction to Internet and Web Technologies	1	2	02
7	CSE016	Introduction to Linux	1	2	02
8	CSE017	Introduction to MATLAB	1	2	02
9	CSE018	LaTeX	1	2	02
10	CSE019	Python Programming Basics	1	2	02

Course Code: **CSE010**	Course Title: **Basic Computer Applications**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Designed to aim at imparting a basic level appreciation programme for the students.
- The incumbent is able to the use the computer for basic purposes of preparing his personnel / business letters, viewing information on Internet (the web), sending mails, using internet banking services etc.
- Allows a learner to be a part of computer users list by making them digitally literate.

Unit – I (9)

Knowing computer: What is Computer, Definition, Evolution, and Types of Computers Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting harware and peripherals to CPU, Basic Computer Maintenance; Disk Cleanup and defragmentation, Software Updates and Security.

Unit – II (9)

Operating System: Basics of popular Operating Systems - Windows, Linux, macOS; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, File Management and Organization; Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Unit – III (9)

Microsoft Office Suite: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document. Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.

Unit – IV (9)

Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Introduction to Google Workspace or Microsoft 365, Instant Messaging; Netiquettes. Making Small Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

Unit – V (9)

Introduction to Internet: WWW and Web Browsers, web navigation, web safety and security: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, Search Engines. Introduction to programming logic.

Textbooks:

1. Introduction to computers by Peter Norton, Tata McGraw Hill.

Reference Books:

1. Computer Fundamentals by V. Rajaraman, Pearson Education.
2. Microsoft Office 2019 Step by Step" by Joan Lambert and Curtis Frye
3. Unix concepts and applications, Sumitabha Das, Tata McGraw Hill.

Course Code: **CSE011**	Course Title: **C Programming Basics**	Credits: **02** L – **01** P – **02**

Course Outcomes (COs):

- Design and implement algorithms and flowchart for simple problems.
- Use syntax and semantics in C programming.
- Define and describe C programming concepts like data types, control structures.
- Solve problems using conditional operators.
- Solve problems using loops and arrays.

Unit – I **(6)**

Introduction to problem solving, flowcharts, algorithms.

Unit – II **(5)**

Introduction to programming, structure of C program, data types, constants, variables and operators in C language, basic C program examples.

Unit – III **(5)**

Introduction to conditional branching, examples.

Unit – IV **(8)**

Introduction to loops, examples.

Unit – V **(6)**

Arrays, examples. Basic idea of functions and pointers.

Textbooks:

1. B. W. Kernighan and D. M. Ritchie, The C Programming Language, Prentice Hall of India.

Reference Books:

1. A. Shaw, Learn C the hard way: Practical exercises on the computational subjects you keep avoiding (like C), Addison-Wesley Professional.

Online Resources:

1. **Introduction to Programming in C NPTEL Course (IIT Kanpur)** (https://archive.nptel.ac.in/courses/106/104/106104128/)
2. **Programming in C:** (https://youtube.com/playlist?list=PLdl2B3KkY5upMjvwuJ0PWQnFSz2L7h4tJ&si=RkPTC8evnC7DsdXz)
3. **Online Compiler:** (https://www.onlinegdb.com)

Course Code: **CSE012**	Course Title: **Computer Fundamentals**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Understand introductory concepts of computer
- Understand basic organization of computer system
- Perform conversion between different number systems
- Utilize the Internet Web resources and describe various types of networks
- Solve common business problems using appropriate Information Technology applications and systems.

Unit – I (5)

Overview of Computer Systems, Evolution of Computers, A Simple Computer Model, Hardware and Software essentials of a computer, Characteristics of Computers, Basic Operations of a computer System.

Unit – II (5)

Input / Output Units: Defining input and output units, types and description of Input –Output devices, Printing devices. Storage: Primary memory, Memory Cell, Memory organization, ROM, RAM and its types, Secondary storage devices and its types, Introduction to binary, decimal, octa and hexadecimal number systems.

Unit – III (5)

System Software and utilities, Application Software, Licensed and open source software's, Need of Operating Systems, Types of Operating Systems, File operations (Create, Delete, copy, move) Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of OS Setup; Common utilities, Introduction to command line interface.

Unit – IV (5)

Introduction to Internet, WWW and Web Browsers: Introduction to http, https and ftp, web security, Basic of Computer networks; LAN, WAN; network topologies, Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, Search Engines.

Unit – V (10)

LAB:

Microsoft office (MS Word, MS Excel, MS PowerPoint), Introduction to Linux operating system. Introduction to programming concepts, Algorithms, Pseudocode, and Flowcharts, control statements.

Textbooks:

1. Introduction to computers by Peter Norton, Tata McGraw Hill.

Reference Books:

1. Computer Fundamentals by V. Rajaraman, Pearson Education.
2. Unix concepts and applications, Sumitabha Das, Tata McGraw Hill.
3. Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne
4. Computer Networking: Principles, Protocols and Practice" by Olivier Bonaventure

Course Code: **CSE013**	Course Title: **Cyber Security Essentials**	Credits: **02** L – **2** P – **0**

Course Outcomes (COs):

- Understand the cyber security threat landscape.
- Develop a deeper understanding and familiarity with various types of cyberattacks, Cyber-crimes and vulnerabilities and their impact.
- Analyze and evaluate the digital payment system security and remedial measures against digital payment frauds.
- Analyze and evaluate the security aspects of social media platforms and ethical aspects associated with use of social media.
- Increase awareness about cyber-attack vectors and safety against cyber-frauds.

Unit – I (5)

Defining Cyberspace and Overview of Computer Network, Architecture of cyberspace, Internet, World wide web, Advent of internet, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Unit – II (8)

Elements of Information Security, Data Stealing and its impact, Hacker – Types of Hackers, Networking and Computer Attacks, Introduction to cryptography, Symmetric and Asymmetric Ciphers, Malicious Software (Malware), Types of Malware, Protection Against Malware. Password Cracking.

Unit – III (7)

Classification of cyber-crimes, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime, IT Act 2000 and its amendments, Organizations dealing with Cyber-crime and Cyber security in India, Case studies.

Unit – IV (5)

Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.

Unit – V (7)

Digital payments – Introduction and components, Modes of digital payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions. Relevant provisions of Payment Settlement Act,2007. End Point device and Mobile phone security, Downloading and management of third-party software, Significance of host firewall and Ant-virus.

Textbooks:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)

Reference Books:

1. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001).
2. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
3. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
4. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
5. Fundamentals of Network Security by E. Maiwald, McGraw Hill.
6. Cryptography and Network Security, Behrouz A. Forouzan.

Course Code: **CSE014**	Course Title: **Data Science Basics**	Credits: **02** L – **2** P – **0**

Course Outcomes (COs):

- Understand the basic concepts of data science.
- Understand various data preprocessing techniques.
- Understand the concept of frequent itemset mining.
- Understand the concept of classification of data.
- Understand the concept of clustering of data.

Unit – I **(5)**

Introduction to data science, applications of data science, types of data.

Unit – II **(6)**

Preprocessing of data, various techniques of preprocessing.

Unit – III **(6)**

Frequent itemset mining, frequent itemsets, Apriori algorithm.

Unit – IV **(7)**

Classification, purpose, applications, *k*NN algorithm.

Unit – V **(6)**

Clustering, purpose, applications, *k*-means algorithm.

Textbooks:

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, Elsevier, Third Edition.

Reference Books:

1. Mohammed J. Zaki, Wagner Meira Jr., "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press.

Online Resources:

1. https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

Course Code: **CSE015**	Course Title: **Introduction to Internet and Web Technologies**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- To understand the basic concepts of internet and web 2.0.
- To understand how the client-server model of Internet programming works.
- To understand interactive web applications.
- To learn the markup languages, and Web3 development.
- To understand the complete front end web development model.

Unit – I **(8)**

Introduction to the Internet: Brief overview of Internet, www, search engines, Search Engine Optimization Techniques, overview of Internet and routing protocols, Overview of Client Sever communication, Cyber law, Web Based Systems.

Unit – II **(8)**

Internet Services and Applications; Email, FTP, and other essential online services, Introduction to Web-based applications. **Web 2.0:** Search, content networks, user-generated content, blogging, social networking, social media, tagging, social bookmarking, rich Internet applications, web services etc.

Unit – III **(8)**

Mark up Languages (HTML, XHTML): HTML, dynamic HTML, XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, Meta elements.

Unit – IV **(8)**

Cascading Style Sheets (CSS): Separation of content and presentation, inline styles, embedded style sheets, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, box model and text flow, media types, building a CSS drop-down menu, user style sheets.

Unit – V **(8)**

JavaScript: Client side scripting, control statements, functions, arrays, objects, events. **Document object model:** Objects and collections, Extensible Markup Language (XML) and RSS: Advantages and applications, structuring data, XML namespaces, Document Type Definitions (DTDs), XML vocabularies, RSS.

Textbooks:

1. *"HTML, CSS, and JavaScript All in One*," Julie C. Meloni and Jennifer Kyrnin, Pearson Education India.
2. J. Miller, V. Kirst and Marty Stepp, Web Programming Step by Step, Step by Step Publishing; 2nd edition (2012).

Reference Books:

1. *"JavaScript and jQuery: Interactive Front-End Web Development,"* Jon Duckett, Wiley.
2. Deitel H.M. and P. J. Deitel, Internet & World Wide Web. How to Program, 4/e, Prentice Hall, ISBN 0131752421, 2008.

Online Resources:

1. https://www.udemy.com/course/complete-web-development-course/

Course Code: **CSE016**	Course Title: **Introduction to Linux**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Understand the basic set of commands and utilities in Linux systems.
- Learn the important Linux library functions and system calls.
- Learn and develop software for Linux systems.
- Understand the inner workings of UNIX-like operating systems.

Unit – I (6)

Introduction to GNU/Linux OS; Free and Open Source Software; Windows OS vs Linux OS; Virtual Box, Downloading and Installing Virtual Box, Creating virtual machine, Linux Distributions, Different way to install Linux, Setting up and running Linux environment; The command line environment. Knowing hardware of your machine - commands such as hwinfo, lshw, df, free etc. Diagnostics - commands to fetch hardware information such as battery state, memory modules etc.

Unit – II (7)

Introduction to packages and repositories. Using 'apt' commands to manage packages. Linux File Editors "sed" command, User account management, Switch users and Sudo access, Monitor users, Linux Directory Service - Account Authentication, System utility commands (date, uptime, hostname, which, cal, bc etc.), Processes and schedules (systemctl, ps, top, kill, crontab and at), System Monitoring Commands (top, df, dmesg, iostat 1, netstat, free etc.)

Unit – III (6)

File Systems, File Permissions (chmod), File Ownership (chown, chgrp), Getting Help (man, whatis etc.), TAB completion and up arrow keys, Adding text to file, Standard output to a file (tee command), Pipes, File Maintenance Commands, File Display Commands, Filters / Text Processing Commands (cut, sort, grep, awk, uniq, wc), Compare Files (diff, cmp), Compress and un-compress files/directories (tar, gzip, gunzip), Truncate file size (truncate), Combining and Splitting Files (cat and split).

Unit – IV (7)

Enabling internet in Linux VM, Network Components, Network files and commands (ping, ifconfig, netstat, tcpdump, networking config files), NIC Information (ethtool), NIC or port bonding, Download files with URLs (wget), curl and ping commands, File transfer commands (ftp, scp etc.), System updates and repositories (rpm and yum), System Upgrade/Patch Management, Create Local Repository from CD/DVD, Advance Package Management, Rollback Patches and Updates, SSH and Telnet, DNS, Hostname and IP Lookup (nslookup and dig).

Unit – V (5)

Managing shell variables. Prompt strings. Symbolic links and hard links, brief introduction to inode numbers. Exploring the root file system and related commands. Using shell shortcuts with commands. Slicing output. Managing programs currently running on the machine. Shell access to a local / remote machine.

Textbooks:

1. Wale Soyinka, "*Linux Administration A Beginners Guide"*, 5th edition, Tata McGraw-Hill, 2009.
2. Mc Kinnon, Mc Kinnon, "*Installing and Administrating Linux*", 2nd edition, Wiley, 2004.
3. Steven Graham, Steve Shah, "Linux Administration A Beginners Guide",3rd edition, Dreamtech press , 2003.

Reference Books:

1. Richard Petersen, "*Linux:The Complete Reference*", 6th edition, Tata McGraw-Hill, 2007.
2. Mark G. Sobell. **"***Practical Guide to Fedora and Red Hat Enterprise Linux"*, 6th Edition, Prentice Hall, 2011.

List of Experiments

1. Learning installation and upgradation of the Linux operating system.
2. Basic Linux commands: User and session management commands: useradd, groupadd, userdel, groupdel, passwd;
3. General purpose utilities: echo, printf, bc,who, whoami, tty, uname, clear, ls.
4. Linux commands: cat-create a file, append a file and open a file. file, wc, cp, rm, mv, more, head, tail, gzip, gunzip.
5. Linux editor- commands, navigation commands and creating an editor file.
6. Finding a file containing a particular text string
7. Regular expressions in grep command.
8. Search multiple words / string pattern using grep command on bash shell.
9. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
10. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
11. Write a program to generate Fibonacci series
12. Write a program to check whether given string is palindrome or not
13. Write a shell script to find factorial of a given integer.
14. Write a shell script to list all of the directory files in a directory.
15. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l |sort

Course Code: **CSE017**	Course Title: **Introduction to MATLAB**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Introduce students to the MATLAB environment and its basic functionalities.
- Familiarize students with MATLAB programming concepts and syntax.
- Enable students to perform data visualization using MATLAB plotting tools.
- Introduce basic numerical computing techniques in MATLAB.
- Provide hands-on experience with MATLAB for solving engineering and scientific problems.

Unit – I **(4)**

Introduction to MATLAB Environment:
Overview of MATLAB interface and tools, Working with MATLAB desktop and command window, Basic operations: creating variables, performing calculations, Introduction to MATLAB script files and execution

Unit – II **(6)**

MATLAB Fundamentals:
MATLAB variables, data types, and operators, Introduction to arrays and matrices in MATLAB, Basic MATLAB functions and built-in mathematical operations.

Unit – III **(6)**

Data Visualization in MATLAB:
Plotting data using MATLAB plotting functions, Customizing plots: labels, titles, legends, and colors, Introduction to 2D and 3D plotting techniques in MATLAB

Unit – IV **(8)**

MATLAB Programming Basics: MATLAB scripts and functions: creation and execution, Control flow statements: if-else, loops (for, while), Introduction to MATLAB debugging techniques

Unit – V **(6)**

Basic Numerical Computing in MATLAB:
Introduction to numerical methods: differentiation, integration, Solving linear equations and systems using MATLAB, Introduction to symbolic mathematics in MATLAB

Textbooks:

1. "Essential MATLAB for Engineers and Scientists" by Brian Hahn and Daniel T. Valentine - Academic Press
2. "MATLAB for Engineers" by Holly Moore - Pearson

Reference Books:

1. "MATLAB for Dummies" by Jim Sizemore and John Paul Mueller - For Dummies
2. "Numerical Computing with MATLAB" by Cleve Moler - Society for Industrial and Applied Mathematics (SIAM)

Course Code: **CSE018**	Course Title: **LaTeX**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Install LaTeX and its related components on a home/personal computer.
- Use LaTeX and various templates acquired from the course to compose Mathematical documents, presentations, and reports.
- Access CTAN and other resources to obtain additional LaTeX packages.
- Use various methods to either create or import graphics into a LaTeX document.
- Use the beamer package to create presentations.

Unit – I (5)

Introduction to LaTeX, Brief History, Merits of LaTeX over Word Processors, Demerits of LaTeX, Installation of the software LaTeX, Understanding LaTeX Compilation, LaTeX input file structure, Latex programming and commands, sample packages.

Unit – II (8)

Document class, page style, parts of the document, Classes: article, book, report, beamer, slides. IEEtran, Preamble, Basic Syntex: Creating a Title Page, Page Numbering and Headings, Modifying Text, etc, Use Packages, Error messages: Some sample errors, list of LaTeX error messages. Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles and subtitles; Command names and arguments, environments, declarations; Theorem like declarations, comments within text.

Unit – III (7)

Writing equations, Matrix, Tables, Math in LaTeX, Advanced Math in LaTeX. Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Page Layout: Titles, Abstract, Chapters, Sections, Equation references, citation.

Unit – IV (5)

List making environments, Table of contents, Generating new commands, Figure handling, numbering, List of figures and Figure Caption, List of tables and Table caption, References to figures and tables in text, Generating bibliography and index.

Unit – V (7)

Picture environments; extended pictures, other drawing packages; Applications to: Writing Resume, Preparing Book and Project Report, Writing question paper, Writing articles/ research papers, Presentation using beamer; Pstricks: drawing simple pictures, Function plotting, drawing pictures with nodes; Tikz: drawing simple pictures, Function plotting, drawing pictures with nodes.

Textbooks:

1. Guide to LATEX, fourth edition, Helmut Kopka,Patrick W.Daly

Reference Books:

1. Guide to LATEX, fourth edition, Helmut Kopka,Patrick W.Daly
2. A Document Preparation System, User's Guide and Reference Manual, L. Lamport, Addison - Wesley, New York, second edition, 1994.
3. LATEX and Friends, M.R.C. van Dongen, Springer-Verlag Berlin Heidelberg 2012.
4. LATEX Cookbook, Stefan Kottwitz, Packt Publishing 2015.
5. Learning LATEX, David F. Griffths and Desmond J. Higham, Siam 2016.
6. Practical LATEX, George Gratzer, Springer 2015.
7. TEX for the Beginner, W. Snow, Addison-Wesley, Reading, 1992
8. The TEX Book, D. E. Knuth, Addison-Wesley, Reading, second edition, 1986

Course Code: **CSE019**	Course Title: **Python Programming Basics**	Credits: **02** L – **1** P – **2**

Course Outcomes (COs):

- Gain a solid understanding of Python programming language basics.
- Demonstrate proficiency in using control structures.
- Acquire the skills to manipulate common data structures in Python.
- Understand and apply the principles of Object-Oriented Programming (OOP).
- Gain exposure to Python libraries and frameworks for practical applications.

Unit – I **(8)**

Introduction to Python: Why Python?, History, Features, and Applications, Python 2 vs. Python 3, Setting up Python Environment; Installation of Python, Introduction to IDEs (Integrated Development Environments), Python Basics; Variables, Data Types, and Operators, Basic Input and Output.

Unit – II **(6)**

Control Flow and Functions: Control Structures; Conditional Statements (if, elif, else), Loops (for, while), Functions; Defining Functions, Parameters.

Unit – III **(8)**

Data Structures in Python: Lists and Tuples; Operations and Methods, Dictionaries and Sets; Key-Value, String Manipulation; String Operations and Methods.

Unit – IV **(7)**

File Handling:, File Handling; Reading and Writing Files in Python.

Unit – V **(6)**

Python Libraries: Overview of Python Libraries; NumPy, Pandas.

Textbooks:

1. "Python Cookbook" by David Beazley and Brian K. Jones
2. "Fluent Python" by Luciano Ramalho

Reference Books:

1. "Python for Data Analysis" by Wes McKinney.
2. "Automate the Boring Stuff with Python" by Al Sweigart
3. "Python Crash Course" by Eric Matthes.