T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS -61 : Linux Programming

Course Outcomes:
At the end of the course, a student shall be able to :
- understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
- Explore the design issues associated with operating systems.
- understand issues related to file system interface and implementation.
- understand and identify potential threats to operating systems and the security features design to guard against them.
- work on various types of operating systems including Linux.

Total credits: 04   **Total lectures: 60**
Course content
Unit 1.   (4)
Operating system , Types of operating system , Functions of operating system , History and development of Linux , Features of Linux , Concept of shell , kernel , Kernel-shell relationship

Unit 2.   (12)
Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.Sed-Scripts, Operation, Addresses, Commands, awk-Execution, Fields and Records,Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications.
Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts

Unit 3.   (8)
Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links - symlink, link, unlink.Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

Unit 4.   (12)
Process - Process concept, Layout of a C program image in main memory. Process environment-environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

Signals - Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

Unit 5. (12)

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example.Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Socket options-setsockopt and fcntl system calls, Comparison of IPC mechanisms.

Unit 6. (12)

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pies-creation, IPC between related processes using unnamed pipes, FIFOs- creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions .Message Queues- Kernel support for messages, APIs for message queues, client/server example.Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

TEXT BOOKS:

1. Unix System Programming using C++, T. Chan, PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Unix Network Programming, W. R. Stevens, PHI.

REFERENCE BOOKS:

1. Beginning Linux Programming, 4th Edition, N. Mathew, R. Stones, Wrox, Wiley India Edition.
2. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson.
3. SystemProgramming with C andUnix, A. Hoover, Pearson.
4. Unix System Programming, Communication, Concurrency and Threads, K. A. Robbins, Pearson Education.
5. Unix shell Programming, S. G. Kochan and P. Wood, 3rd edition, Pearson Education.
6. Shell Scripting, S. Parker, Wiley India Pvt. Ltd.
7. Advanced Programming in the unixEnvironment, 2nd edition, W. R. Stevens and S. A. Rago, Pearson Education.
8. Unix and Shell Programming, B. A. Forouzan and R. F. Gilberg, Cengage Learning.
9. Linux System Programming, Robert Love, O'Reilly, SPD.
10. C Programming Language, Kernighan and Ritchie, PHI.

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CS – 62: Internet Technologies-II

Course Outcomes:

At the end of the course, a student shall be able to :

- understand basics of the Internet and World WideWeb
- acquire knowledge and skills for creation of web site considering both client and server-sideprogramming
- learn basic skill to develop responsive webapplications
- understand different web services
- understand and implement concepts of PHP.
- learn application development using PHP.

Total credits: 04   **Total lectures: 60**

Course content

1. Introduction   **(08)**

Open source concepts, features, applications, Execution of PHP, comments in php , client server architecture ,types of server, web browser, php advantages

2. PHP   **(10)**

PHP Basic, Intro , Install, Syntax, Variables, constants, Operators, echo and print statement

3. Control Structures   **(10)**

If statement, If...Else statement, nested if…else statement, Switch , While Loops ,for loop

3.Functions: **(10)**

Definition ,declaration ,types of functions, built-in functions and user defined functions
String functions str_word_count, strrev, strops, str_replace, substr, substr_count, substr_replace, User defined functions

5.Arrays in PHP   **(08)**

Definition ,declaration of an array, types of an arrays,PHP scripts on arrays.

6.Form and File System   **(08)**

Form Designing, controls of form, operations on file, modes of file, error handling

7. Security and Case Studies   **(06)**

Authentication, Authorization (Permissions), Encryption
Apache server, Linux, Mozilla (Firefox), Wikipedia, Open Office, Open Source Projects, Open source applications .

Reference Books :-

1. Programming PHP   - Kevin tatore
2. Practical PHP programming – Huddson
3. Understanding Open Source Software Development – Joseph Feller and Brian Fitzgerald

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS – 63 : Compiler Construction

Course Outcomes:

At the end of the course, a student shall be able to :
- Understand, design and implement lexical analyzer
- design and implement parser
- Understand, design and code generation scheme

Total credits: 04   **Total lectures: 60**

Course content

Unit 1   **(10)**

Definition of Compiler, Aspects of compilation ,The structure of Compiler. Phases of Compiler – Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code generation, code optimization, code generation. Error Handling ,Introduction to one pass &Multipass compilers, cross compiler, Bootstrapping.

Unit 2   **(10)**

Review of Finite automata as a lexical analyzer, Applications of Regular Expressions   and Finite Automata (lexical analyzer, searching using RE), Input buffering, Recognition of tokens LEX: A Lexical analyzer generator (Simple Lex Program)

Unit 3   **(16)**

 Definition , Types of Parsers, Top-Down Parser ,Top-Down Parsing with Backtracking: Method & Problems , Drawbacks of Top-Down parsing with backtracking, Elimination of Left Recursion(direct & indirect) Need for Left Factoring & examples , Recursive Descent Parsing : Definition ,Implementation of Recursive Descent Parser Using Recursive Procedures , Predictive [LL(1)]Parser(Definition, Model) , Bottom-Up Parsers , Operator Precedence Parser -Basic Concepts ,Operator Precedence Relations form Associativity & Precedence , Operator Precedence Grammar LR Parser Model Types [SLR(1), Canonical LR, LALR] Method & examples. YACC program sections, simple YACC program for expression

Unit 4   **(10)**

Syntax Directed Definition ,Syntax Directed Definitions(SDD) ,Inherited & Synthesized Attributes , Evaluating an SDD at the nodes of a Parse Tree, Example, Evaluation Orders for SDD's, Dependency Graph , Ordering the Evaluation of Attributes, S-Attributed Definition , L-Attributed Definition , Application of SDT , Construction of syntax trees

Unit 5   **(4)**

 Memory Allocation, Memory allocation – static and dynamic memory allocation, Memory allocation in block structure languages, Array allocation and access.

Unit 6   **(10)**

Code Generation and Optimization Compilation of expression, Concepts of operand descriptors and register descriptors with example.Intermediate code for expressions – postfix notations, triples and quadruples, expression trees. Code Optimization – Optimizing transformations – compile time evaluation, elimination of common sub expressions, dead code elimination, frequency reduction, strength reduction

Reference Books:

1. Compilers: Principles, Techniques, and Tools ,Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman Principles of Compiler Design By : Alfred V. Aho, Jeffrey D. Ullman (Narosa Publication House)
2. LEX & YACC (O'reilly Publication)

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS - 64: Programming in JAVA-II

Course Outcomes:
At the end of the course, a student shall be able to :
- understand files and perform operations on files
- analyze User Interface using Swing and AWT
- get familiar with threading concepts

Total credits: 04   **Total lectures: 60**

Course content

1. **Java input output**   **(10)**
   File, Output stream, Reader reading text, writer, InputstreamReader,
   OutputstreamReader, CharacterStreamClasses, fileinputstream and fileoutputstream

2. **Applet Programming**   **(10)**
   Types of applet, Applet Life cycle, Creating applet, Applet tag, Graphics class ,paint
   methods, drawing shapes

3. **AWT and Event Handling**   **(10)**
   Components used in AWT, AWT controls

4. **Layout managers**   **(10)**
   flow layout, border layout, Grid layout, Listeners types, Adapter classes

5. **Introduction to Swing**   **(10)**
   Swing controls, JLabel, JTable, JTextField, JTextArea, JCheckbox, JComboBox,
   JTable,Component and container Event handling in swing,

6. **MultiThreading**   **(10)**
   Threading basics, Life cycle of thread ,Creating Threads ,Priorities and Synchronization
   ,Inter Thread Communication ,Runnable Interface

Reference Books :
1. Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy

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CS- 65 : Unified Modeling Language

Course Outcomes:

At the end of the course, a student shall be able to :
- analyze and model software specifications.
- abstract object-based views for generic software systems.
- deliver software components using UML approaches

Total credits: 04   **Total lectures: 60**

Course content
1. **Object Modeling**   **(12)**
   Characteristics of objects, Object oriented development object oriented Themes, Use of OOD, object and Classes links and association, Generalization, Inheritance Grouping Constructs, Aggregation, Abstract Class, Multiple Inheritance, Restriction.
2. **Dynamic Modeling**   **(08)**
   Events and States, Operations, Nested State Diagrams.
3. **Design Methodology**   **(08)**
   Steps in Analysis & Design, Decomposition of System
4. **Introduction to UML**   **(08)**
   Overview of the UML, Conceptual Model of UML Architecture.
5. **Basic Structural Modeling**   **(08)**
   Classes, Relationships, Common Mechanism, Class Diagrams Object Diagram.
6. **Basic Behavioral Modeling**   **(08)**
   Interactions, Use Cases, Use CASE Diagram, Interaction Diagrams, Activity Diagrams.
7. **Architectural Modeling**   **(08)**
   Components, Component Diagram, Deployment Diagram

Reference Books:
1. Object Oriented Analysis.- James Rambaugh
2. The Unified Modeling Language User Guide.- Goody Booch, James Rambaugh
3. UML in a Nut Shell.- Orelly

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS PXII: Computer Science Practical –XII

Course Outcomes:
At the end of the course, a student shall be able to :
- use shell commands and understand the purpose.
- write and execute shell scripts for performing various operations
- understand and execute awk programming

Total Credits:2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Simple Unix Commands – date ,ls, mv, cp, cd, bc etc.

2. File commands : create ,copy, delete etc.

3. Filtering Commands- sed, tr etc.

4. Shell Scripts- Use of if statements, case etc.

5. Shell Scripts- loop statements etc.

6. Grep commands

7. Head, tail,sort commands

8. Shell Scripts- Use of multiple options, passing arguments to shell

9. AWK programming

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS PXIII: Computer Science Practical -XIII

Course Outcomes:

At the end of the course, a student shall be able to :

- use HTML form elements that work with any server-side language.
- create a PHP web page that is unique to each visitor.
- validate user input.
- create, back up and restore a MySQL database.
- perform various MySQL database queries

Total Credits:2
Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1.Basic tags of PHP

2.PHP programs based on operators

3. Programming on decision making statements

4. Programming on looping

5. Programming on functions

6. Programming on strings

7. Programming on Array

8. Designing Forms

9. Files operations

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CS PXIV: Computer Science Practical -XIV

Course Outcomes:
At the end of the course, a student shall be able to :
- use applet for internet programming
- create a swing to develop web page
- perform various layout Manager
- use multithreading concept

Total Credits:2

Practical Examination
 A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Applet
2. File handling
3. Graphics design
4. Awt controls
5. Grid layout
6. Flow layout
7. Swing controls
8. Applet
9. multithreading

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS MII : Mini Project-II

Course Outcomes:
At the end of the course, a student shall be able to :
- apply knowledge and techniques learnt in theoretical classes for developing the s/w for real problems.
- get an insight into the working of the real organizations/companies.
- Gain deeper understanding in specific functional areas.
- explore career opportunities in their areas of interest.

Total Credits:2

Guidelines for the Mini Project Formulation
The course Mini Project is one that involves requirement analysis, feasibility analysis, Database design, coding, testing, implementation and maintenance. Every student is required to carry out Mini Project work under the supervision of a Mentor. The mentor shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the Coordinator.

Mini Project Synopsis Content
Mini Project proposal should be prepared in **consultation with the Mentor.** It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis.
Mini Project synopsis may contain required number of pages and sequence of contents should be in the following order:
1) Title of the Project
2) Synopsis Approval Performa
3) Index
4) Acknowledgement
5) Introduction and Objective of the Mini Project
6) Analysis (Feasibility Study, DFD 0 Level, 1- Level and 2 Level/ER Diagram etc)
7) H/W and S/W Requirement
8) Table and Structure, Number of Modules, Detail of Modules, Data Structure
9) Types of Reports
10) Future Scope

Mini Project Report Formulation
The Mini Project may contain 70-100 pages (excluding coding) with double spacing.
The project documentation must be with respect to the project only. Mini Project Report should follow the points given below:
1) Cover and Title page
2) Synopsis Approval Certificate/Company Certificate
3) Index
4) Acknowledgement
5) Certificate of Originality
6) Introduction/Aims and Objective
7) System Analysis
7.1 Identification of Need
7.2 Preliminary Investigation

8) Feasibility Study
8.1 Technical Feasibility
8.2 Economic Feasibility
8.3 Operational Feasibility
9) Analysis (Feasibility Study, DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure etc).
10) S/W Engineering. Paradigm applied
11) S/W & H/W Requirement Specification
12) System Design
13) Screen Shots
14) Coding
15) Validation Checks
16) Implementation and Maintenance
17) Testing (Testing techniques and Testing strategies)
18) System Security measures
19) Various types of Reports/Modules
20) Pert Chart/Gantt Chart
21) Future scope of the Mini Project (452)
22) Bibliography/References/Glossary
23) Original Copy of the Approved Synopsis

The cover page must be hard bound in *Black Color; with Gold Embossing*.
All the students are required to use either Arial / Times New Roman of font size 12 throughout the report and in heading and subheadings font size shall be 14 .
Two copies of the Mini Project report in bound form is to be prepared by the student
(one for the college and one for himself/herself for future reference)

 All the copies must be duly signed by the in-charge faculty as per the schedule provided to you. One copy of the Mini Project Report must be retained by the student which should be produced before the examiner at the time of the Viva-voice. The student must bring the soft copy of the projects as desired by the external examiner at the time of the viva voce.
Each student is required to make a copy of Mini Project in CD and submit along with his/her Mini Project report.
Mini Project can be developed in any language/ platform / package . Students can develop applications using tools/languages/Software which may be in use in
their current organization where they may be undertaking the Mini Project(not mandatory)

MINI PROJECT EVALUATION
As per the University norms Mini Project Report shall be evaluated by the examiner at the end of the semester. However there will be continuous monitoring of the
Mini Project progress report during the semester and distribution of marks shall be as follows:
 Mini Project Evaluation Scheme
Mid Sem.Presentation : 40
End Sem Presentation Viva Project Evaluation :60

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CS- 66 : Data Communication and Networking-II

Course Outcomes:
At the end of the course, a student shall be able to :
- build an understanding of the fundamental concepts of computer networking.
- Get familiarize with the basic taxonomy and terminology of the computer networking area.
- Explore to the advanced networking concepts, preparing the student for entry to advanced courses in computer networking.

Total credits: 04   **Total lectures: 60**

Course content

Physical Layer   **(5)**
Design issues, functionality, theoretical basis for public data communication, switched network, mobile telephone system

Data Link Layer   **(8)**
Design issues, functionality, data link layer protocols, error correction and detection, elementary data link layer protocol, sliding window protocol

Network Layer   **(15)**
Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.), Congestion control Algorithms (Principles, Policies, Algorithms),Quality of Service (Requirements, Techniques, Integrated Services & Differentiated Services),Network Layer Protocols (IP Addressing , CIDR & NAT, IP layer protocols

Protocols and Tools   **(12)**
Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Medium Access Control
(8) Motivation for a specialized MAC (Hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA.

 Network Security   **(12)**
Cryptography, symmetric –key algorithms, public key algorithm, digital signatures, management of public keys, IPs,firewalls ,virtual private networks, wireless security,security issues and challenges in wireless network, authentication protocols, internet security and social media

References:
1. Behrouz and Forouzan - Introduction to Data Communication and Networking -
2nd Edition - TMH - 2001.
2. Jean Walrand Communication Networks (A first course) - Second Edition - WCB McGraw Hill - 1998.

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CS -67 : Data Analytics –II

Course Outcomes:

At the end of the course, a student shall be able to :

- implement statistical analysis techniques for solving practical problems
- perform statistical analysis on variety of data
- learn and work on Unsupervised Learning and Challenges for Big Data Analytics
- explore prescriptive analytics

Total credits: 04   **Total lectures: 60**

Course content

Prerequisite: This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable.

1. Supervised Learning with Regression and Classification techniques -II   (18)

Regression and Classification Trees

Support Vector Machines

Ensemble Methods: Random Forest

Neural Networks

Deep learning

2.Unsupervised Learning and Challenges for Big Data Analytics   (22)

Clustering Associative Rule Mining

Association Rules Analysis

Decision Tree

Challenges for big data analytics

3.Prescriptive analytics   (20)

Creating data for analytics through designed experiments

Creating data for analytics through Active learning

Creating data for analytics through Reinforcement learning

Reference Books:

1. Hastie, Trevor, et al.The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger.Applied statistics and probability for engineers. John Wiley & Sons, 2010

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CS – 68 : Research in Computer Science -II

Course Outcomes:

At the end of the course, a student shall be able to :

- acquire familiarity with the concepts and relevant to research in computer science
- gain knowledge of report writing
- design applications using ICT tools for research
- get an insight for plagiarism in research

Total credits: 04   **Total lectures: 60**

Course content

1. **Report writing**   **(15)**

   Introduction and meaning, definitions, importance, precautions in report writing. Steps in report writing, structures and layout of research report. Requisites of a good research report and problems of research report. Plagiarism and its avoidance.

2. **Statistical methods for data analysis**   **(15)**

   Types of data, Measures of Central Tendency and Dispersion,
   Correlation and Regression.

3. **ICT tools for research**   **(30)**

   a. Spreadsheet tool : Introduction to spreadsheet applications, features and functions, using formulae and functions, data storing, features for statistical data analysis, generating charts, graphs and other features(Tools: Microsoft Excel, Open Office and similar or other advanced tools)

   b. Presentation tool: Introduction to presentation tools, features and functions, creating presentations, customizing presentation(Tools used: Microsoft Power point, Open Office or any other tool)

   c. Web resources for research : Introduction to Internet, using search engines and advanced search tools.

References:

1. C. Radhakrishna Rao, Statistics and Truth, CSIR, 1989.
2. Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, 2010. 4. Day RA, How To Write and Publish a Scientific Paper, Cambridge University Press, London, 1992.
3. Latour, B. and Woolgar., Laboratory Life: The Construction of Scientific Facts, 2 nd Edition, Princeton: Princeton University Press, 1986

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