

Assam Women's University



Syllabus of PGDCA programme

(As passed in BoS held on 10.08.2022)

Department of Information & Computer Science

School of Engineering & Technology

About PGDCA Programme

Name of the programme: Post Graduate Diploma in Computer Application

Duration: One year (2 semesters)

Eligibility criteria: Bachelor's Degree in any discipline with at least 45% marks (relaxation of marks according to Government rules and regulation)

Programme Objective: The programme is designed with the aim

PO1. To deliver the concepts of hardware and software components of computer.

PO2. The programme also includes the introductory skills of application software development.

Programme Outcomes:

After the completion of the programme learner will be able to

PO1. Work with different office automation software such as Microsoft Office or LibreOffice package etc.

PO2. Create basic 3D animation, including key-framing, timing, and animation principles.

PO3. Design general purpose application based on C/C++ and HTML based language.

PO4. Handle Windows and Linux Operating System for general purpose applications and networking.

PO4. Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO5. To work in any public or private sector organization as a computer professional.

Distribution of courses (Name, Code and Credit) in PGDCA Programme

Semester	CGPA mandatory Course			Non CGPA Mandatory Course		Total Credit
	Core courses (Credit=4 or 2)	Discipline Specific Elective Courses (Credit=4)	Generic Elective Courses (Credit=4)	Skill Enhancement Course (Credit=2)	Ability Enhancement Course (Credit=2)	
I	Programming in C & Basic Data Structures (PDCAC1401) (2+1+1)	DSE-1		Communication Skills in English (PDCAS1201) (1+1+0)	Linux Administration (PDCAA1201) (0+0+2)	18
	Fundamentals of Computer (PDCAC1402) (2+1+1)					
	Introduction to Web Technology (PDCAC1403) (2+1+1)					
	Gender Sensitization (1+1+0)					
II	Operating System (PDCAC2402) (2+1+1)	DSE-2	GE	-		20
	Database Management System (PDCAC1402) (2+1+1)					
	Project (PDCAC2403) (0+0+4)					
Total Credit						38

Credit distribution of courses

Semester	Credit of CGPA Mandatory Courses			Credit of Non CGPA Mandatory Courses		Total Credit
	Core courses	Discipline Specific Elective Courses	Generic Elective Courses	Ability Enhancement Courses	Skill Enhancement Courses	
I	3x4	1x4	-	1x2	1x2	18
	1x2	-	-	-	-	
II	3x4	1x4	1x4	-	-	20

Total credit = 38

List of Department Specific Elective Courses (DSE)*

Semester	Serial No	Course Code	Credit (L+T+P)	Course Title
1	1	PDCAE1401	4(3+1+0)	Programming Paradigms
	2	PDCAE1402	4(3+1+0)	Introduction to Cyber Security
	3	PDCAE1403	4(2+1+1)	Basic 3D Modelling and Animation using Blender
	4	PDCAE1404	4(3+1+0)	Computer Network
2	1	PDCAE2401	4(2+1+1)	Embedded Programming using Arduino
	2	PDCAE2402	4(2+1+1)	Advanced Web Technology
	3	PDCAE2403	4(2+1+1)	Financial Accounting with Tally
	4	PDCAE2404	4(2+1+1)	Java Programming

***Student has to choose one Discipline Specific Elective out of four (4) Discipline Specific Electives in each semester**

Core Courses

Programming in C & Basic Data Structures
Fundamentals of Computer
Introduction to Web Technology
Operating System
Database Management System
Project

Programming in C & Basic Data Structures

PDCAC1401

1. About the Course

This is a *Core Course* and is aimed at making a student comfortable with designing an algorithm and to program thereon to solve a problem. The second part of the course introduces elementary data structures used in a program. The course is organized as a series of lectures with both theory and laboratory sessions.

2. Course Description

Target Audience:

First semester students of PGDCA programme offered by the Department of Information & Computer Science.

Course Period: One semester (14 Weeks)

Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)

Lectures: 42 Hours (14 Weeks X 3 Hours)

Practical: 28 Hours (14 Weeks X 2 Hours)

Total Credit (L + T + P): 4 (2 + 1 + 1)

Total Contact Hours per week: 5

2.1 Prerequisites and Dependencies

Since this course is a first semester course, there is no particular prerequisite. However, the students are expected to have elementary knowledge of basic mathematics and logic. Some primary understanding of computer operation is desirable.

The medium of communication in the class is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objectives

The major objective of this course is to equip students with the skills to think of the solution to a problem and then to convert it to an efficient C program using various high-level constructs offered by C programming language. Moreover, the course aims to enable students to handle data within a program in an efficient way.

2.3 Course Outcomes

This course has the following learning outcomes.

- CO1. Understanding the approach to solve a problem.
- CO2. Making a student capable to write an algorithm to solve a problem.
- CO3. Writing an efficient C program with appropriate data structures.

3. Course Contents

Module I: Introduction to computer and programming

Contact Hrs: 10

Computer, block diagram of computer, hardware, software, program, types of software, operating system, compiler, programming languages, types of programming languages, algorithm, pseudocode, flowchart, desirable characteristics of a program, C programming language, history of C, structure of a C program, C character set, identifiers and keywords, writing, compiling and executing a c program, datatypes, constants, escape sequences, string constants, variables and arrays, declarations, expressions, statements, symbolic constants.

Module II: Operators and I/O

Contact Hrs: 10

Arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operator, data input output, single character input, single character output, data input from user: scanf function, writing output data: printf function, display formatting using printf function, the gets and puts function.

Module III: Control statements

Contact Hrs: 10

Control statements, branching statement, looping statements: for, while, do-while, switch statement, break statement, continue statement, goto statement

Module IV: Functions and arrays

Contact Hrs: 10

C functions, defining a function, calling a function, function prototypes. Passing arguments to function, call by value, call by reference, recursion, defining an array, processing an array, passing array to a function, multidimensional array.

Module V: Strings and pointers

Contact Hrs: 10

Defining and initializing a string, null character, reading and writing a string, library functions for strings, pointers, pointer declaration.

Module VI: Structures and unions

Contact Hrs: 10

Structure, defining a structure, processing structure, user defined data types, union, defining a union, processing union.

Module VII: Data structures

Contact Hrs: 10

Abstract data type, Data structure, Stack, primitive operations on stack, implementation of push and pop operations in C, queue, primitive operations on queue, C implementation of queue operations, Linked list, primitive operations on list, linked lists using dynamic allocation.

4. Laboratory Sessions

The practical component of this course is of two credit which amounts to 4 hours of Laboratory classes per week. Following are the components that will be covered in the practical sessions.

- Introduction to editor, compiler, debugger and IDE

- Compilation process of a C program
- Basic C programs with input and output statements
- C programs to handle data types and variables
- C programs with branching statements
- C programs with looping statements
- C programs with array
- Handling strings in a C program
- Multi-dimensional array in C program
- C programs to handle pointers
- Functions in C program
- Structure and Union in C program
- C programs to implement stack, queue
- C programs to implement linked list

5. Referential Sources

Books:

1. Byron S Gottfried, "Programming With C". McGraw Hill
2. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language". Pearson Education India

Fundamentals of Computer

PDCAC1402

1. About the Course

This is a *Core Course* and is aimed at presenting foundation concepts of a computer, its peripherals and various components like Registers, Arithmetic & Logic Unit, Control Unit and Memory etc. The course is organized as a series of lectures, hands-on exercises using Laboratory sessions on various free and open-source software.

2. Course Description

- Target Audience:
 - First semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Contact Hours per week: 5

2.1 Prerequisites and Dependencies

Since this course is a first semester course, there is no particular prerequisite. However, the students are expected to have elementary knowledge of basic mathematics and logic.

Language of teaching is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

The major objective of this course is to provide students with understandings of how a computer works, what are its various components, different types of peripherals used, concept of hardware and software, types of memories in a computer. Basic usage of some free and open-source software is also a major part of the course.

2.3 Course Outcomes

After course completion, following are the learning outcomes.

- CO1. Understanding foundation concepts of information and information processing in computer systems.
- CO2. Understanding of the basic components of a computer: ALU, CU, Memory, etc.
- CO3. Understanding various computer terminologies.
- CO4. Differentiation among Hardware, Firmware and Software.

3. Course Contents

Module I: Introduction

Contact Hrs: 10

What is computer, Computer characteristics, Computer evolution and generations, Types of computers, Basic components of computer-- Control unit, ALU, Input/output device and memory.

Module II: CPU and Memory Unit

Contact Hrs: 20

CPU architecture-components of CPU, instruction set, register set, speed, types of processors, Memory architecture-storage criteria, primary vs secondary storage, main memory, word length of a computer, Types of memory chips- RAM, ROM, PROM and EPROM, Cache memory, Secondary storage-sequential access and direct access, Magnetic tape, Magnetic disks, Optical disks, Flash drive, memory card, RAID storage

Module III: Input and Output Devices

Contact Hrs: 10

Input devices-Keyboards, point and draw device, scanner, Digitizer, Electronic card reader, Speech recognition devices, Light pen and Touch screen etc., Output Devices-Monitors, Printers, Plotters, Screen image projector etc., Input/output interfaces-device controller, serial and parallel ports, USB Standard, SCSI

Module IV: Software and Operating System

Contact Hrs: 30

Software-concepts and needs, Types of software-system and application software, Algorithm, Flowchart, Pseudo code, Programming Language-Machine language, Assembly language and High-level language, Assembler, Compiler and Interpreter, Operating system and its main functions, Various Operating systems-DOS, UNIX, Windows etc.

4. Laboratory Sessions

The practical component of this course is of one credit which amounts to 2 hours of Laboratory classes per week.

4.1 Section 1: Office Package (LibreOffice)

- Introduction to Windows 10 OS Environment, Command Prompt, Navigation using GUI based File Explorer (This PC), Concept of Desktop, Icons, Folders and Files, Introduction to Command Prompt.
- Hands-on various CMD Prompt commands, Environment Variables in Windows.
- Introduction to Linux (Lubuntu) Environment, Concept of Terminal and Terminal commands.
- Introduction to Spreadsheet software: LibreOfficeCalc – Layout, Formula Bar, Cell Address, Font design and formatting, Arithmetic Operators (+, -, * and /), Aggregate functions (Avg, Sum, Max, Min and Truncate, etc.), Relational Operators (>, <, >=, <=, =, !=) Introduction to If .. else statement.
- Nested If..else statement, Logical Operators (&, | and !).
- Count If, Introduction to 2D and 3D Graphs – Bar, Pie, Line, Vector, XY Labelling etc.
- Absolute and Reference Cell Addressing, Pivot Table.

- Introduction to Documentation software: LibreOffice Writer – Page Layout, Page Orientation, Page Columns, Font and Paragraph design, Introduction to Numbered and Bullet List and Sub-list, Table design.
- Insertion of Images and shapes, Formatting an Image, Page wrap, Alignment, Insertion of text box. Header and Footer, Page Number, Page Break, Template Design.
- Cover Page design and concept of Mail Merge (using LibreOfficeCalc).
- Introduction to Presentation software: LibreOffice Impress – Slide Layout, Master Slide Design, Font and Paragraph Design, Inserting Image and graphs.
- Slide and Custom element Animation. Properties of animation (speed, Event of occurrence, Duration, etc.)

4.2 Section 2: Multimedia (GIMP, Audacity & OpenShot)

- Introduction to Image editing software: GNU Image Manipulation Program (GIMP). Environment of GIMP. Concept of Layering, Introduction to various Tools.
- Class exercise on GIMP.
- Introduction to Audio editing software: Audacity, Concept of Monophonic and Stereophonic sound, Concept of channels (L-R), Fading, Combining different Audio tracks.
- Class exercise on Audacity.
- Introduction to Video editing software: OpenShot, Intro to its environment, Concept of tracks, Trimming and Fade effects (Audio and Visual).
- Class exercise on OpenShot.

5. Referential Sources

Useful Books and Papers

- RajaramanV. “Fundamentals of Computer”. PHI Publishing.
- Sinha P.K. “Foundation of Computing”. PHI Publishing.

Introduction to Web Technology

PDCAC1403

1. About the Course

This is *Core Course* and is aimed at teaching skills to design interactive websites. The course is designed to deliver key technology components like descriptive language and client-side program elements.

2. Course Description

- Target Audience: 1st semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit Hours per week: 5

2.1 Prerequisites and Dependencies

The course does not have any prerequisite.

The course teaching language is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

The main objective of this course is to provide knowledge on web architecture, web services and client-side technologies to focus on the development of web sites.

2.3 Course Outcomes

After course completion, following are the learning outcomes.

CO1. Understanding fundamental web concepts (HTTP, URIs, Web browsers, etc.).

CO2. Acquiring skills to write Client-side scripts.

3. Course Contents

Module I: Introduction

Contact Hrs: 10

Computer and network, Intranet vs Internet, Client-Server Computing, IP address, Internet services, Hyper Text Transfer Protocol (HTTP), HTTP transaction-persistent vs non-persistent, Ports and sockets, Proxy Server.

Module II: World Wide Web

Contact Hrs: 10

Architecture-client, server, Uniform Resource Locator(URL), Domain Name Service(DNS), Address resolution, Name resolution, Web documents-static document, dynamic document

and active documents, Cookies, Virtual hosting, Browser, Browser architecture, HTTP request and response.

Module III: Markup Language

Contact Hrs: 25

Markup language, SGML, HTML, HTML tags and attributes, Cascading Style Sheet (CSS).

Module IV: Web Programming

Contact Hrs: 25

Scripting language, Client-side Scripting Language and Server Side Scripting Language, Writing Java Script.

4. Laboratory Sessions

The practical component of this course is of one credit which amounts to 2 hours of Laboratory classes per week.

- Introduction to HTTP, HTTPS, Web Browsers, URIs.
- Introduction to basic HTML, Class exercise on HTML.
- Introduction to CSS, Internal, Inline and External.
- Client-side scripting language.
- Introduction to client-side libraries (Bootstrap and JQuery)

5. Referential Sources

Useful Books and Papers

- Tanenbaum, "Computer Network". Pearson India.
- Powell Thomas A., "HTML & CSS The Complete Reference". McGraw Hill.

Useful Web Sources

- <https://nptel.ac.in/courses/106/105/106105084/> : NP-TEL content.

Operating System

PDCAC2401

1. About the Course

This is a *Core Course* and is aimed to make students understand the concepts of the most important system software called operating system. The course covers various issues of operating system that one needs to know to understand the structure of an operating system.

2. Course Description

- Target Audience:
 - 2nd semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Contact Hours per week: 5

2.1 Prerequisites and Dependencies

Operating system course has a dependency on “Programming in C” course. A student needs to be also aware of basic concepts like hardware components, software and types of software, which are covered under the course titled “Fundamentals of Computer”.

The medium of communication in the class is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

The major objective of this course is to provide students with understanding of the overall structure of an operating system.

2.3 Course Outcomes

After course completion, following are the learning outcomes.

- CO1. Understanding Process Management module of operating system.
- CO2. Understanding Memory Management module of operating system.
- CO3. Understanding File System Management module of operating system.
- CO4. Understanding I/O management module of operating system.

3. Course Contents

Module I: Basics

Contact Hrs: 10

Operating System Functionalities, Types of Operating Systems, Structure of Operating System, Distributed Systems, Services, System Calls, Virtual Machines, System Boot.

Module II: Process Management**Contact Hrs: 20**

Process Scheduling - Uniprocessor scheduling algorithms, Multiprocessor and Real-time scheduling algorithms, Process Synchronization - Peterson's Solution, Bakery Algorithm, Semaphores, Critical Regions, Monitors - Deadlock prevention, deadlock avoidance and Deadlock Detection and Recovery - Bankers Algorithm, Threads.

Module III: Memory Management**Contact Hrs: 20**

Swapping, Contiguous Memory Allocation, Paging Structure of the Page Table Segmentation, Virtual memory, Demand Paging, Page Replacement

Module IV: I/O System**Contact Hrs: 20**

I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Device drivers - block and character devices, streams, Character and Block device switch tables.

4. Laboratory Sessions

This course contains 2 hours of practical classes per week. Following topics will be covered in the laboratory classes.

- Introduction to various process, memory and file management commands in windows operating system.
- Introduction to various process, memory and file management commands in linux operating system.
- Introduction to system calls in linux operating systems.
- Introduction to system calls in windows operating systems.

5. Referential Sources**Books:**

- Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts". Wiley India Pvt. Ltd
- Maurice Bach, "Design of the Unix Operating System". Prentice Hall India Learning Private Limited

Database Management System

PDCAC2402

1. About the Course

This is a *Core Course* that deals with designing, maintenance and transaction of database systems. This course is organized as a series of lectures with both theory and laboratory sessions.

2. Course Description

- Target Audience:
 - 2nd semester students of PGDCA programme.
- Course Period: One semester (14 Weeks)
- Total Class Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2+ 1 + 1)
- Total Contact Hours per week: 5

2.1 Prerequisites and Dependencies

This is a core course of PGDCA programme. There is no prerequisite for this course.

2.2 Objective

The main objective of the course is to equip students with the skills of database design. The principles and techniques involved in designing an effective and good database.

2.3 Course Outcomes

On completion of the course, students

- Will have a broad understanding of database concept and DBMS software
- Will be able to design a database for an application software, at conceptual level using ER modelling tool and to convert that database into implementation level using Relational model.
- Will be able to model a good normalized database to remove redundant data.
- Will be able to write SQL commands to work with any database.

3. Course Contents

Module I: Introduction

Contact Hrs: 10

Database approach, database system architecture, introduction to DBMS, database administrator, database designers

Module II: Entity Relationship Model

Contact Hrs: 10

Database design and ER Model, Constraints, ER Diagrams, weak entity sets, subclasses, superclasses, and inheritance

Module III: Relational Database Management System and SQL

Contact Hrs: 40

Relational database schemas, Key constraints-candidate key, primary key and Foreign key

Conversion from ER model to Relational model, Dependencies and Normal Forms- 1NF, 2NF and 3NF SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, insert, delete and update statements in SQL, assertions, triggers, views, schema change statements, introduction to PL/SQL

Module IV: DBMS Softwares

Contact Hrs: 10

Licensed vs open sourced DBMS software, Oracle RDBMS, Microsoft Access, Microsoft SQL Server, MySQL, SQLite, PostgreSQL etc.

4. Laboratory Sessions

The practical component of this course is of one credit, i.e., 2 hours of lab classes per week. The laboratory work consists of the following.

- Introduction to DBMS software and SQL.
- DDL to create, change schema of database and relation and to grant access right.
- SQL data type.
- Insert, update, delete and retrieval queries in SQL.
- Specifying primary and foreign key and other integrity constraints.
- Nested SQL queries and joining of tables.
- Triggers

5. Referential Sources

Books:

- RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems.
- AviSilberschatz, Henry Korth, S. Sudarshan, Database System Concepts.

Project

PDCAC2403

1. About the Course

This is a *Core Course* and is aimed to teach student to apply the knowledge gained so far, to build some simple application or website.

2. Course Description

- Target Audience:
 - 2nd semester students of PDCA programme only.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 112 Hours (14 Weeks X 8 Hours)
 - Lectures: Nil
 - Practical: 112 Hours (14 Weeks X 8 Hours)
- Total Credit (L + T + P): 4 (0 + 0 + 4)
- Total credit hours per week: 8

2.1 Prerequisites and Dependencies

Prerequisites are all the courses that the student has learned so far.

2.2 Objective

Primary objective is to encourage students to build some information system, application software or website.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. Students will gain the confidence to build simple application software, website etc.
- CO2. Students can explore different research related area of Computer Science
- CO3. Students will make herself ready to work in any public or private sector organization

3. Course contents

Topics will depend on the project that the student will work for.

Discipline Specific Elective Courses

Programming Paradigms
Introduction to Cyber Security
Basic 3D Modelling and Animation using Blender
Computer Networks
Embedded Programming using Arduino
Advanced Web Technology
Financial Accounting with Tally
Java Programming

Programming Paradigms

PDCAE1401

1. About the Course

This is a *Discipline Specific Elective Course*. The objective of this course is to make students understand and learn all different paradigms of programming, their advantages and disadvantages and to be able to apply in practical problems.

2. Course Description

- Target Audience:
 - 1st semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 56 Hours (14 Weeks X 4 Hours)
 - Lectures: 56 Hours (14 Weeks X 4 Hours)
 - Practical: Nil
- Total Credit (L + T + P): 4 (3 + 1 + 0)
- Total Credit Hours per week: 4

2.1 Prerequisites and Dependencies

There are no prerequisites for this course. The course teaching language is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

This course is aimed at-

- Introducing students to functional, logic and concurrent programming paradigms.
- Enabling students to formulate newer abstractions (both procedure and data) in the above paradigms.
- Familiarizing students with writing functional and concurrent programs.
- Preparing students to solve complex real-world problems using appropriate programming paradigms

2.3 Course Outcomes

After course completion, following are the learning outcomes.

CO1. Understand and apply the concepts that form the basis of functional, logic and concurrent programming paradigms

CO2. Formulate abstractions with procedures and data in different programming paradigms

CO3. Write programs in different programming paradigms especially functional, logic and concurrent paradigms

CO4. Formulate, implement and solve a given problem scenario using appropriate programming paradigm

3. Course Contents:

Module I: Abstract Machines and Programming Language

Contact Hrs: 7

The concept of abstract machine and of interpreter, the interpreter, The hardware machine, Implementation of a language, Hierarchies of abstract machines, levels of description Grammar and syntax, Context-free grammars, Contextual syntactic constraints, Compilers, Semantics, Pragmatics.

Module II: Foundations

Contact Hrs: 7

The halting problem, Expressiveness of programming languages, Formalism for compatibility, Functions and algorithms, Names and denotable objects, Environment and Blocks, types of environment, Operations on environment, Static scope, Dynamic scope, Scope problems.

Module III: Memory Management

Contact Hrs: 7

Techniques for Memory management, Static memory management, Dynamic memory management using stacks, Activation records for inline blocks, Activation records for procedures, Stack management, Dynamic memory management using a heap, Fix length blocks, Variable length blocks, Static scope: the static chain and the display, Dynamic scope: association lists and CRT.

Module IV: Control Structure and Control Abstraction

Contact Hrs: 7

Expressions, Expression syntax, Semantics of expressions, Evaluation of expressions, The concept of command, the variable, Assignment, Sequence control commands, Commands for explicit sequence control, Conditional commands, Iterative commands, Structured programming, Tail recursion, Recursion or iteration?, Subprograms, Functional abstraction, Parameter passing, Higher order functions, Functions as parameters, Functions as results, Exceptions.

Module V: Structuring Data

Contact Hrs: 7

Data types, type systems using static and dynamic checking Scalar types: Booleans, characters Integers, Reals, fixed point, Complex, Void, Enumerations, Intervals, Ordered types, Composite types: records, Variant records and unions, Arrays, sets, Pointers, Recursive types, Functions, Equivalence by name, Structural equivalence, Compatibility and conversion, Polymorphism, Overloading, Universal parametric polymorphism, Subtype universal polymorphism, Remarks on implementation, Type checking and inference, Avoiding dangling references, Tombstone, Locks and keys, Garbage collection, Reference counting, Mark and sweep, Interlude using pointer reversal, Mark and compact, Copy.

Module VI: The Object-Oriented Paradigm

Contact Hrs: 7

The limits of abstract data types, Fundamental concepts of OOP, Objects, Classes, Encapsulation, Subtypes, Inheritance, Dynamic method lookup, Single inheritance, The problem of fragile base class, Dynamic method dispatch in in the JVM, Multiple inheritance, Polymorphism and generics, Subtype polymorphism, Generics in Java, Implementation of generics in Java, Generics erase in substract hierarchy, Covariant and Contravariant overriding.

Module VII: The Functional Paradigm**Contact Hrs: 7**

Computations without state, Expressions and functions, Computation is reduction, Values, Capture free substitution, Evaluation strategies, Comparison of the strategies, programming in a functional language, Local environment, Interactiveness, Types, Pattern matching, Infinite objects, Imperative aspects, The SECD machine.

Module VIII: The Logic Programming Paradigm**Contact Hrs: 7**

Deduction as computation Syntax, The language of first-order logic, Logic programs, Theory of unification, The logic variable, Substitution, The computational model, The herbrand universe, Declarative and procedural interpretation, Procedure calls, Non determinism control, Prolog, Logic programming and databases, Logic programming with constraints, Advantages and disadvantages of the logic paradigm.

4. Referential Sources**Books**

- M. Gabbrielli & Simone Martini, "Programming Languages: Principles and Paradigms", Springer.

Introduction to Cyber Security

PDCAE1402

1. About the Course

This is a *Discipline Specific Elective Course* and is aimed at making a student understand how to protect and defend computer systems and networks from cybersecurity attacks.

2. Course Description

- Target Audience:
 - 1st semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
- Total Class Hours: 56 Hours (14 Weeks X 4 Hours)
 - Lectures: 56 Hours (14 Weeks X 4 Hours)
 - Practical: Nil
- Total Credit (L + T + P): 4 (3 + 1 + 0)
- Total Credit hours per week: 4

2.1 Prerequisites and Dependencies

There are no prerequisites for this course.

2.2 Objective

The major objective of this course is to inform students with different types of cybersecurity attacks and to identify vulnerabilities critical to the information assets of an organization.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
- CO2. Develop policies and procedures to manage enterprise security risks.

3. Course Contents

Module I: Introduction to Cyber Crime

Contact Hrs: 16

History of Internet, Internet Addresses, DNS, Internet Infrastructure, World Wide Web, Classification of cyber crimes, Reason for commission of cyber crimes, malware and its types: Adware, spyware, virus, worms, trojan horses, scareware, ransomware, Types of cyber crimes: cyber stalking, forgery and counterfeiting, software piracy, phishing, spamming, cross site scripting, online auction fraud, logic bombs, web jacking, Denial of service attack, salami attack, email spoofing

Module II: Authentication and Computer Forensics

Contact Hrs: 15

Encryption, Digital Signatures, Antivirus, Firewall, Steganography, Computer Forensics, Introduction to some recent cyber crimes, why to report cyber crime, Counter cyber security

initiatives in India, Generating secure password, Using Password manager, enabling two-step verification, securing computer using free antivirus

Module III: Windows Firewall

Contact Hrs: 10

Introduction to windows firewall, configuration, How to start and use windows firewall with advanced security, Inbound and Outbound rules, Browsers, safe browsing, clearing cache in browsers, Adblockers

Module IV: WLAN and Email Security

Contact Hrs: 15

General tips on using social networking platforms safely, posting personal details, sharing online contents, email security tips, smartphone security guidelines: platforms and OS's, Branded and locked smartphones, secure communications using Voice and Message

4. Referential Sources

Books:

- Jonson A. Thomas, "Cybersecurity: Protecting Critical Infrastructures". CRC Press.
- Pande J., "Introduction to Cyber Security". Uttarakhand Open University Publication.

SWAYAM Link

- https://onlinecourses.swayam2.ac.in/nou22_ge67/preview : SWAYAM course.

Basic 3D Modelling and Animation using Blender

PDCAE1403

1. About the Course

This is a *Discipline Specific Elective Course*. The objective of this course is to teach the students very fundamentals of Animation. They will get to learn all the principles which will help them to learn and understand how actual animation works.

2. Course Description

- Target Audience:
 - 1st semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks x 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit Hours per week: 5

2.1 Prerequisites and Dependencies

The students are expected to have knowledge on mathematics, basic geometry and knowledge on programming will be helpful. The course teaching language is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

Nowadays 3D modelling is used in variety of industries to showcase their products, thus opening profitable benefits. This course is a unique opportunity for students to learn the fundamentals of 3D modelling tools and techniques with practical methods starting from the basics of blender.

- Identifying blender user interface.
- Outlining the workflow of 3D content creation.
- Discussing various tools and techniques for creating 3D models in Blender.
- Compute and solve common 3D mesh topology.

2.3 Course Outcomes

After course completion, following are the learning outcomes.

- CO1. Students will learn animation fundamentals
- CO2. Knowledge about using animation principles
- CO3. Create / Design 3D models
- CO4. Explore 3D visualization concepts
- CO5. Enhance your 3D modelling, texturing, and lighting skills

3. Course Contents:

Module I: Introduction to Blender Interface

Contact Hrs: 10

GUI, Blender Screen, Interface Inputs, Keyboard shortcuts, Window Arrangements, the 3D Window, window modes, layers, object tools panel, moving in 3D space, The Blender view menu, properties window, python script, outliner window, Navigation, windows file explorer, Append or Link command, packing data, importing objects.

Module II: Creating and Editing Objects

Contact Hrs: 10

Working with basic meshes, placing object in scene, edit mode and object mode, Mesh types, cursor placement, moving, scaling and rotating objects, precision manipulation, transformation widgets, mesh vertex editing, creating vertices, center points, smooth and flat shading option, proportional vertex editing, extruding shapes, object groups, adding faces, Bezier curves and circles.

Module III: Materials and Textures

Contact Hrs: 10

Materials, material settings, material colors, preview, specular and diffuse tabs, harness value, ramp shaders, halo settings, transparency and reflection, vertex painting, assigning texture color, Introduction to textures, material texture, texture mapping, Displacement mapping, UV mapping, texture paint.

Module IV: World Settings, Lighting and Camera

Contact Hrs: 10

Mist, star, texture as background, image as background, image as template, lighting types and settings, lamp settings, cameras, camera setting options, camera switching and tracking.

Module V: Rendering and Ray Tracing

Contact Hrs: 10

Rendering an image or video, playback, movie file rendering, video codecs, making a movie, ray tracing, cycles ray trace rendering.

Module VI: Animation Basics

Contact Hrs: 20

Introduction to Animation, editing curves, automatic key framing, scaling, rotation using f-curves, animating other features, keying sets, vertex animation, animation following curves, displacement sound animation control, Introduction to 3D text, converting text to mesh object, converting text to curve, elefont 3d text, Nurbs and Metashapes.

4. Referential Sources

Books

- John M Blain, "The Complete Guide to Blender Graphics".
- Roland D Hess, "Animating with Blender".

Computer Networks

PDCAE1404

1. About the Course

This is a *Discipline Specific Elective Course* and is aimed to make the students understand the concepts of computer network and make them capable of configuring networks and handling issues that arise in a computer network. The course covers layers of TCP/IP model, viz., Data Link to Network layers.

2. Course Description

- Target Audience:
 - 1st semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 56 Hours (14 Weeks X 4 Hours)
 - Lectures: 56 Hours (14 Weeks X 4 Hours)
 - Practical: 0 Hours
- Total Credit (L + T + P): 4 (3+ 1 + 0)
- Total Credit Hours per week: 4

2.1 Prerequisites and Dependencies

Computer Network has no dependency. The medium of communication in the class is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

The major objective of this course is to provide students with understanding of all the aspects of a communication over a network and all the standards related to such communication. This course presents understanding of entire communication process and standards between a pair of programs under execution (processes). The course also includes lab component that covers the basics of networking.

2.3 Course Outcomes

After course completion the students, will have the following learning outcomes.

- CO1.** Understanding the basic concepts of data communication and computer networks.
- CO2.** Understanding the functions of Physical layer in TCP/IP model.
- CO3.** Understanding the functions of Data link layer in TCP/IP model.
- CO4.** Understanding the functions of Network layer in TCP/IP model.

3. Course Contents

Module I: Introduction

Contact Hrs: 10

Data communications, components, data representation, data flow, networks, physical structure of network, network models, categories of networks, Internetwork, Internet,

protocols, OSI model, layers in the OSI model: physical layer, data link layer, network layer, transport layer, session layer, presentation layer, application layer, TCP/IP protocol suite

Module II: Digital Signals

Contact Hrs: 10

Analog and digital data, analog and digital signals, periodic and non-periodic signals, sine wave, amplitude, frequency, phase, composite signal, bandwidth, bit rate and bit length of a digital signal, digital signal transmission, attenuation, distortion and noise

Module III: Network Media

Contact Hrs: 5

Communication Media & Connectors –Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Fiber Optic and coaxial cable: RJ-45, RJ-11, BNC. Understanding color codes of CAT5 cable.

Module IV: Network Devices

Contact Hrs: 5

Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point

Module V: Internet Addressing

Contact Hrs: 10

Physical address, logical address, port number, IPv4 address, IPv4 address space, classful addressing, classless addressing, DHCP, NAT, subnetting, supernetting, routing, unicast and multicast routing

Module VI: Network Protocols

Contact Hrs: 10

Internet protocol, RIP, OSPF, BGP4, UDP, TCP, ICMP, SNMP, HTTP, SMTP, POP3

Module VII: Internet Services

Contact Hrs: 6

World Wide Web, File Transfer Protocol, E-mail, Telnet, Secure Shell, Domain Name System

4. Laboratory Sessions

Since this course does not have any practical classes. Following topics will be covered in tutorial sessions.

- Introduction to switches, routers, cables.
- Crimping of cat 6 cables.
- Various networking commands in windows operating systems.
- Various networking commands in linux operating systems.
- Configuring a LAN using switches and cat 6 cable.

5. Referential Sources

Books:

- Forouzan Behrouz A., “Data Communications and Networking”. Mcgraw Hill
- Stallings William. “Data and Computer Communications”. Pearson Education India

Embedded Programming using Arduino

PDCAE2401

1. About the Course

This is a *Discipline Specific Elective Course* and students will learn how the Arduino platform works in terms of the physical board and libraries and the IDE (Integrated Development Environment). The course will also cover programming the Arduino using C code and accessing the pins on the board via the software to control external devices.

2. Course Description

- Target Audience:
 - Students of PGDCA programme only.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit Hours per week: 5

2.1 Prerequisites and Dependencies

Students are expected to have basic knowledge on computers including algorithm and programming. Courses on “Introductory Computing using C” and “Data Structures using C++” are prerequisite for this course.

2.2 Objective

This course is designed for students to educate in various Embedded Development strategies and to introduce Bus Communication in processors, Input/output interfacing by imparting knowledge on various processor scheduling algorithms.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. The students will be specialized in Embedded System Design using Arduino
- CO2. Students will learn open-source computer hardware/software platform for building digital interactive devices

3. Course Contents

Module I: Basics of Embedded System Design

Contact Hrs: 10

What is Embedded System, Main Components of Embedded Systems, Constraints of Embedded System, Power dissipation, Embedded System Classifications (Small Scale, Medium Scale, Sophisticated) and its Components, Processors: General purpose, Single purpose, Application Specific, Concepts of microprocessor and microcontroller, and other

Elements of Embedded System, What is Program/Software/Simulator/Compiler and their applications within Embedded Systems

Module II: Learning Arduino Platform

Contact Hrs: 10

Microcontrollers, Programming Microcontrollers, Arduino Platform, The Boards, The Anatomy of an Arduino Board, The Development Environment, Learning about Analog, Digital, Power, Other Pins, External/USB power supply, reset button, and other components of Arduino Board, Learning the standard library (13 default) of Arduino, Arduino Development Environment: Arduino Software, Different menus and Serial Monitor of Arduino IDE, Acquiring the skills for writing Arduino Sketches, working with examples, Interfacing some led, switch, Potentiometer with Arduino

Module III: Basics of Sensors and Actuators

Contact Hrs: 20

How Sensors Work, Analog and Digital Sensors, Pull-Up/Down resistors and Examples of sensors, Connecting different sensors such as: Humidity, Heat/Temperature, proximity, IR Motion, Accelerometer, Sound, Light, distance, Pressure, Thermal, Infrared, LDR etc. to Arduino Board, Working on LCD monitor, Reading Various Sensor data on Serial Monitor and LCD Display, Actuators, Relay Switch, Servo Motor, Putting things together, Sensing the World, Reading from Analog Sensors

UNIT IV: Activities

Contact Hrs: 30

Development of a real-time digital clock algorithm, Add on functions: Setting Time, Date, Selection of Time format, Alarms, Development of algorithm for Traffic Light Control

4. Laboratory Session

The practical component of this course is of one credit, i.e., 2 hours of classes per week. The practical component mainly contains circuit design and writing programs for creating interactive machines that are based on prior discussions in theory classes in any high-level language such as C.

- Introduction to Software/Simulation/Compiler/IDE
- Intro to various types of Sensors and Actuators
- Intro to different types and usages of Arduino Boards
- Arduino IDE
- Working on LCD monitor

5. Referential Sources

Books:

- Massimo Banzi, "Getting Started with Arduino". O'Reilly
- Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry". Wiley India.
- John Boxall, "Arduino Workshop: A Hands-On Introduction with 65 Projects". No Starch Press

SWAYAM Link:

- https://onlinecourses.swayam2.ac.in/aic20_sp04/preview: Course on Arduino from IIT, Bombay

Advanced Web Technology

PDCAE2402

1. About the Course

This is a *Discipline Specific Course* and is aimed at teaching skills to design interactive and dynamic web sites. The course is designed to deliver key technology components like descriptive languages and server-side program elements. In addition, the course gives specific contents that are beneficial for developing web-based solutions like communication with a relational database, data security principles and approaches. The focus of this course would be on advanced topics in emerging Web technologies. These include extensions of Web standards, combination of different Web technologies, Web toolkits and development environments, current backend Web frameworks.

2. Course Description

- Target Audience:
 - 2nd semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
- Total Class Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 4 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit hours per week: 5

2.1 Prerequisites and Dependencies

The course is built up on the knowledge of previous courses such as the “Basic Web Technology” course, “Data Structures using C++”. The medium of communication in the class is English, so students have to have communication, reading and apprehension skills of English.

2.2 Objective

The main objective of this course is to provide knowledge on web architecture, web services, server-side scripting technologies to focus on the development of web-based information systems and web services.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. Define the fundamental ideas and standards underlying Web Service Technology.
- CO2. Define the fundamental principles for cloud applications.
- CO3. Discuss concepts at the frontier of industrial practice and emerging standards.
- CO4. Differentiate the major frameworks allowing to develop web services and cloud applications and assess their suitability for specific usage scenarios.

3. Course Contents

Module I: Introduction to PHP

Contact Hrs: 10

PHP Functionalities, Datatypes, Variables, Constants, Arrays, Functions, Strings, System Calls, Explode-Implode and other native functions.

Module II: Core PHP Concepts

Contact Hrs: 15

Handling Html Form with PHP, Working with file and Directories, Sessions and Cookies, Database connectivity using MySQL and MySQLi, Concept of PDO, Performing basic database Operation using DML commands (such as Insert, Delete, Update, Select), Setting query parameter, Executing query Joins (Cross joins, Inner joins, Outer Joins, Self joins.), Exception Handling, Introduction to Wordpress CMS.

Module III: Introduction to Laravel

Contact Hrs: 20

Installation, Artisan CLI, Laravel directory structure, Basic routing, Call a controller method from a route, Template inheritance, Blade conditional statements, Blade Loops, Executing PHP functions in blade, Introduction to Migrations, Migration structure, Creating a basic controller, Creating a route using a closure, Eloquent ORM Models, Eloquent ORM INSERT, READ, UPDATE, DELETE, Using models in controllers.

Module IV: Introduction to NodeJS and ExpressJS

Contact Hrs: 25

Installation procedures, NodeJS console, REPL, TLS/SSL, Debugger, Process, Child Process, Buffers, Streams, File System, Path, Query String, Assertions, Callbacks, Events, TTY, Web-modules, Database connectivity, Intro to ExpressJS, Express.js fundamental concepts like Routing and HTTP Methods, Middleware, Cookies, REST API, Scaffolding, Templating and Error Handling.

4. Laboratory Sessions

This course contains 2 hours of practical classes per week. Following topics will be covered in the laboratory classes.

- Introduction to Server-side scripting technology using PHP.
- Core PHP concepts.
- Introduction to Laravel framework.
- Concept on CMS using Wordpress/Drupal.
- Introduction to NodeJS.
- Introduction to ExpressJS.

5. Referential Sources

Books:

- Papazoglou, "Web Services: Principles and Technology (2nd edition)"; ISBN: 978-0-273-73216-7, Prentice Hall, 2012
- Cerami, "Web Services Essentials"; ISBN: 0596002246, O'Reilly, 2002

Useful Web Sources:

- <https://www.php.net/docs.php> : PHP Documentation
- <https://laravel.com/docs/9.x> : Laravel Documentation

Financial Accounting with Tally

PDCAE2403

1. About the Course

This is a *Discipline Specific Elective Course* and is aimed at making a student understand how to work with well-known accounting software Tally.

2. Course Description

- Target Audience:
 - 2nd semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
- Total Class Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit hours per week: 5

2.1 Prerequisites and Dependencies

There are no prerequisites for this course. However, basic mathematical knowledge is a must.

2.2 Objective

The major objective of this course is to make a student understand and learn to create company, enter accounting voucher entries including advance voucher entries, do reconcile bank statement, do accrual adjustments, and also print financial statements. Financial Accounting with Tally course is not just theoretical program, but it also includes continuous practice, to make students ready with required skill for employability in the job market.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. Students will possess required skill and can also be employed as Tally data entry operator.

3. Course Contents

Module I: Introduction

Contact Hrs: 10

Basic Concepts of Accounting, Financial Statements, Financial Statement Analysis, Cost Centre, Basic concepts of Inventory Tally Configuration & INI setup, Data Directory & Folders configuration, Single & Multiple User, Tally Screen Components, Mouse / Keyboard Conventions & Key, Combinations, switching between screen areas, Quitting Tally. Maintaining Company Data, Basic Company Details, Create/Alter/Select/Load/Close a Company, Chart of Accounts, Company Features, and Configuration.

Module II: Ledgers and Vouchers

Contact Hrs: 10

Create, Alter & Display Groups and Ledgers, All accounting voucher types and transactions, Create and Alter new Voucher type, Item and Account Invoice transactions, Excise Invoice, Export Invoice, Transactions using Bill-wise details Create, Alter & Display Cost Centre and Cost Categories, Cost centre & Cost Category allocation in voucher entry, Creating Cost centre Class, Invoice entry in a Class situation, Create, Alter & Delete Foreign Currencies, Voucher entry using foreign currency, Bank Reconciliation, Interest calculations using simple & advance parameters, Interest calculations on outstanding balances & on invoices, Use of voucher class, adjustment of interest, Creation of voucher class, Invoice entry in a class situation

Module III: Budgets

Contact Hrs: 15

Create, Alter & Delete Budgets for groups, ledgers & cost centres, defining credit limit & credit period, Display Budgets & variances, Create, Alter & Delete a scenario. Enabling Job Costing in Tally, Master creation & configuration for Job costing, Creation of Voucher type & Voucher class for Stock Transactions, Creation of Transfer journal for transfer of stock between godowns, Consumption journal Transactions, payment voucher, Godown summary Report, Job Work Analysis, Material consumption summary. Reports like balance sheet, Profit & Loss account, Ratio analysis, Trial Balance. Accounts books like cash/bank book, all ledgers, Group summary & vouchers, Sales, purchase & journal registers, Cost centre & category summary, Cost centre breakup, ledger & group breakup, outstanding receivables & payables, interest receivable & payable, Statistics, Cash & Fund flow, Day book, List of Accounts, Reversing journals, optional vouchers, post-dated vouchers

Module IV: Stocks

Contact Hrs: 25

Create, Alter & Display Stock Groups and Stock Items, Stock item behaviour using costing and market valuation method, other behaviour like treating all sales as new manufacture, treating all purchases as consumed, treating all rejections inward as scrap, ignoring negative balances, Treating difference due to physical counting, Create, Alter & Display Stock categories, Create, Alter, Display simple & compound units of measures, Stock items using alternate units, Defining standard cost & selling price, Defining Rate of duty, Defining MRP, Create, Alter & Display Godowns, Allocation of items to the Godowns, All inventory voucher types and transactions, Inventory details in accounting vouchers, Defining re-order level, Transactions using tracking numbers, Use of batch-wise details in voucher, Additional cost details in vouchers, Creating Bill of material, Cost estimation, Creating Price list & defining Price levels, invoice using Price list, Zero valued entries, Transactions in case of Different actual & billed quantities. Reports like Stock summary, Inventory books like Stock item, Group summary, Stock transfers, Physical stock register, Movement analysis, Stock group & item analysis, stock category analysis, Ageing analysis, Sales order & Purchase order book, Statement of inventory related to Godowns, categories, stock query, Reorder status, Purchase & Sales order summary, Purchase & Sales bill pending, Exception reports like negative stock & ledger, overdue receivables & payables, memorandum vouchers, optional vouchers, post-dated vouchers, reversing journals.

Module V: Printing and ODBC**Contact Hrs: 10**

Cheque Printing, Common printing options, Different printing formats, Multi-Account printing, Dynamic- Report specific options. Creating Group company, Use of Tally vault, Using Security control & defining different security levels, Use of Tally Audit. Back-up & Restore, Splitting company data, Export & import of Data, ODBC compliance, use of E-mail, Internet publishing, Upload, web browser & online help, Re-write data

4. Referential Sources**Books:**

- Nadhani, "Implementing Tally 6.3", BPB Publications, ISBN: 817656494X
- "BPB Tally 6.3", BPB Editorial Board (Hindi) BPB Publications, ISBN 81-7656-594-6.

Java Programming

PDCAE2404

1. About the Course

This is a *Discipline Specific Elective Course* and is aimed at making a student comfortable with Java and its features. The course is organized as a series of lectures with both theory and laboratory sessions.

2. Course Description

- Target Audience:
 - 2nd semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
- Total Class Hours: 70 Hours (14 Weeks X 5 Hours)
 - Lectures: 42 Hours (14 Weeks X 3 Hours)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 4 (2 + 1 + 1)
- Total Credit hours per week: 5

2.1 Prerequisites and Dependencies

Students are expected to be comfortable in procedure oriented (C) and object-oriented programming (C++). So “Introductory Computing using C” course is a prerequisite for this course.

2.2 Objective

The major objective of this course is to equip students with programming skills to design high-end GUI based applications using Java APIs.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO2. Understanding the approach to solve a problem in java.
- CO3. Writing an efficient Java program with appropriate language constructs to solve a problem.
- CO4. GUI based application development.

3. Course Contents

Module I: Core Java Programming

Contact Hrs: 10

Java Overview: Genesis, Java Philosophy, Java & Internet, Object-Oriented Programming features, Java Applet and Application, Java Environment and Java Development Kit (JDK) & Java Standard Library (JSL), Java language fundamentals, The scope and lifetime of variable, Type conversion and casting, Control statements, Arrays, classes and objects: The this keyword, Garbage collection, Overloading constructor, Using object as parameters, Argument passing, Returning objects, Recursion, Introducing Access control (public, private and protected), static, final, nested classes, String class, Command-line argument

Module II: Inheritance, Exception handling**Contact Hrs: 10**

Inheritance: Member access and inheritance, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance, the Object class; Packages, Interface, classpath, Exception handling: Fundamentals, Exception types, Java's built-in exceptions, user defined exceptions.

Module III: Multithreading and I/O Basics**Contact Hrs: 10**

Multithreaded Programming: The Java thread model (thread priorities, synchronization and inter-thread communication); Deadlock, ThreadGroup, I/O Basics: (Streams, The stream classes, The predefined streams, Reading console input, writing console output, The transient and volatile modifiers, using instance of native methods

Module IV: String handling, Utility classes, java.lang and java.io**Contact Hrs: 25**

String handling: String constructors, methods for character extraction, string searching & comparison, data conversion using valueof (), StringBuffer, Exploring java.lang: Simple type wrappers, System class, class Class, Math functions, The utility classes: Vector, Stack, HashTable, StringTokenizer, Bitset, Date, Calendar, GregorianCalendar, Random, Observable, Input/Output-Exploring java.io: The java.io classes and interface, File class and methods for creating, renaming, listing and deleting files and directories, I/O stream classes (FileInputStream, FileOutputStream, BufferedInputStream, BufferedOutputStream, PushBackInputStream, InputStreamReader, BufferedReader, BufferedWriter, PrintStream, RandomAccessFile)

Module V: Swing**Contact Hrs: 5**

Swing: Component and Container classes, Layout managers (FlowLayout, GridLayout, BorderLayout), Handling events, Adapter classes, Anonymous inner classes Swing GUI components (JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JList, JComboBox, JScrollBar, JScrollPane, JToolTip, JPanel, JFrame), Menus: JMenuBar, JMenu, JMenuItem, JSeparator

Module VI: JDBC**Contact Hrs: 10**

Java database connectivity (JDBC): Introduction to JDBC, type of JDBC connectivity, establishing database connections, Accessing relational database from Java programs

4. Laboratory Sessions

The practical component of this course is of one credit which amounts to 2 hours of Laboratory classes per week. Following are the components that will be covered in practical sessions.

- Introduction to editor, compiler, debugger and IDE.
- Compilation process of a Java program.
- Basic java programs with input and output statements.
- Java programs to handle data types and variables.
- Java programs with branching statements.
- Java programs with looping statements.

- Java programs with array.
- Handling strings in a Java program.
- Multi-dimensional array in Java program.
- Functions in java program.
- Java programs to implement object oriented concepts.
- Multithreading concepts.
- GUI Programming (AWT/Swing).
- Working with database (JDBC/ ODBC connection).

5. Referential Sources

Books:

- Schildt Herbert, "The Complete Reference Java". McGraw Hill.
- Balagurusamy E., "Programming with Java: A Primer". McGraw Hill.

Useful Web Sources

- <https://nptel.ac.in/courses/106105191/> : NP-TEL content.

SWAYAM Link

- https://swayam.gov.in/nd1_noc19_cs84/preview : SWAYAM course.

Skill Enhancement Course

Communication Skills in English

Communication Skills in English

PDCAS1201

1. About the Course

This is a *Skill Enhancement Course* and is aimed at introducing the students to the skills of communication in English, basically the verbal as well as the written communication modes.

2. Course Description

- Target Audience:
 - First semester students of PGDCA programme offered by the Department of Information & Computer Science.
- Course Period: One semester (14 Weeks)
- Total Contact Hours: 28 Hours (14 Weeks X 2 Hours)
 - Lectures: 28 Hours (14 Weeks X 2 Hours)
 - Practical: Nil
- Total Credit (L + T + P): 2 (1 + 1 + 0)
- Total Credit Hours per week: 2

2.1 Prerequisites and Dependencies

Since this course is a first semester course, there is no particular prerequisite.

2.2 Objective

The major objective of this course is to equip students with both speaking and writing skills to handle situations in both academic and professional career.

2.3 Course Outcomes

CO1. Learners will acquire skills to use in different group level discussions as well as personality development.

CO2. They will know how to use English for specific purposes such as classroom interactions, business communication and different formal and informal modes of communication along-with techniques on how to construct note-making, note-taking, memo, letter, précis and report writing etc.

3. Course Contents

Module I: Types and modes of Communication

Contact Hrs: 4

Verbal and Non-verbal, Barriers of Communication, Essentials of good communication.

Module II: Developing Speaking Skills

Contact Hrs: 12

Dialogue, Public Speech, Reading Skills: Comprehension, Precis writing.

Module III: Developing Writing Skills

Contact Hrs: 12

Writing memo, Report writing, Letter writing, Essay writing.

5. Referential Sources

Books:

- Liz-Hamp Lyons and Ben Heasley, "Study Writing: A Course in Writing Skills for Academic Purposes". Cambridge:CUP,2006.
- Krishna Mohan and Meera Bannerjee, "Developing Communication Skills". Macmillan India.

Ability Enhancement Courses

Linux Administration

Linux Administration

PDCAA1201

1. About the Course

This is an *Ability Enhancement Course* and introduces the Linux operating system, including: task scheduling and management, memory management, input/output processing, internal and external commands, shell configuration, and shell customization. Explores the use of operating system utilities such as text editors, electronic mail, file management, scripting, and C/C++ compilers.

2. Course Description

- Target Audience: First semester students of PGDCA programme
- Course Period: One semester (14 Weeks)
 - Total Contact Hours: 42 Hours (14 Weeks X 3 Hours)
 - Lectures: 14 Hours (14 Weeks X 1 Hour)
 - Practical: 28 Hours (14 Weeks X 2 Hours)
- Total Credit (L + T + P): 2 (1 + 0 + 1)
- Total Credit Hours: 3

2.1 Prerequisites and Dependencies

The course does not have any prerequisite.

2.2 Objective

The main objective of this course is to provide knowledge on UNIX/Linux operating system.

2.3 Course Outcomes

After course completion, following are the learning/course outcomes.

- CO1. Students will be able to identify and use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks
- CO2. Effectively use the UNIX/Linux system to accomplish typical personal, office, technical, and software development
- CO3. Monitor system performance and network activities

3. Course Contents

Module I: Introduction

Contact Hrs: 2

Basic nature of the operating system functions and components: Process Control, Memory Management, Input/output control, Security, Popular OS's.

Module II: Terminologies**Contact Hrs: 8**

Command line user interface – CUI, Graphical user interface – GUI, Internal and External commands, Utility programs, Pathing, File transfers, Command processor / command interpreter, File protection, File Encryption, Directory structure, Programming language translators, Server, Daemon(s), Unix file naming conventions: File names, File extensions, Wild carding (globbing), Absolute and relative paths.

Module III: File Types and Editors**Contact Hrs: 8**

Text vs. binary files, Executable vs. non-executable, Character device files, Block device files, Pipes, Sockets, Directories, Text file editing and formatting using: vi, emacs / pico, ed, nl, pr and X window based WYSIWYG text editors: gedit, leafpad

Module IV: File Processing Operations**Contact Hrs: 8**

Create a file, Access a file using the relative pathname, Access a file using the absolute pathname, Erase or delete a file, Copy a file, Move a file, Cut columns of data from a file, Paste / concatenate files, Rename a file, Create a directory, Display the contents of a directory, Display the user initialization files, Change the working directory, Return to the home directory, Remove a directory, Display the file and/or directory information, Change file/directory permissions, Utilities such as sed and awk, Search files, Search for files by attributes, Sort files

Module V: Shell and C/C++ Programming**Contact Hrs: 8**

Shell initialization files, Aliases, Functions, History mechanism(s) sh, ksh, and bash, Shell variables, Script writing, Script debugging, Script usage, Entering C/C++ programs, Finding syntax errors, Compiling, Source files, Object files

Module VI: Client and Server model in Unix**Contact Hrs: 8**

tcp/ip, udp, Electronic mail services, finger, who / w / users, write / chat, telnet, rlogin, ftp, Web browsers, network administration

4. Laboratory Sessions

The practical component of this course is of one credit which amounts to 2 hours of Laboratory classes per week.

- Introduction to Linux environment.
- Introduction to Terminal and commands.
- Introduction to text based editors like: vi, nl, emacs etc and x-window based editors, gedit, leafpad, etc.
- Shell Programming
- C/C++ Programming
- Network administration in Linux environment

5. Referential Sources**Books:**

- Wale Soyinka, "Linux Administration: A Beginner's Guide". McGraw Hill.
- Patrick H. Wood and Stephen G. Kochan, "Unix Shell Programming". Sams.

Web Sources:

- <https://nptel.ac.in/courses/117106113> : NP-TEL content on Linux Basics from IIT Madras.

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