



PGDCA PROGRAMME

Department of Information & Computer Science

SYLLABUS

Syllabus for the introduction of PGDCA programme.

2018 – 2019

ASSAM WOMEN'S UNIVERSITY

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Rowriah, Jorhat-04, Assam
Distribution of courses for PGDCA programme with credit allocation

Program	Semester	Course code	Course title	Type	Credits				Sem. Total
					L	T	P	Total	
PGDCA	I	DIT-01	Fundamentals of Computer	Core	2	1	1	4	21
		DIT-02	Programming in C	Core	3	1	2	6	
		DIT-03	Data Communication & Networking	Core	4	0	0	4	
		DIT-04	Database Management System	Core	3	1	1	5	
		DIT-05	Communication & Soft skills	Core	2	0	0	2	
	II	DIT-06	Data Structure using OOP	Core	4	0	2	6	37
		DIT-07	Web Technology	Core	2	1	1	4	
		DIT-08	Software Engineering	Core	3	0	0	3	
		DIT-09	Operating System	Core	3	1	0	4	
		DIT-10	Project	Core	0	0	20	20	
Course Completion Credit in Total									58

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Syllabus for P.G.D.C.A.

Course title: **Fundamentals of Computer**
Semester: **I**

Course code: **DIT-01**
Credit: **4 (2+1+1)**

UNIT I: Introduction

What is computer, Computer characteristics, Computer evolutions and generations, Types of computers, Basic components of computer --Control unit, ALU, Input/output device and memory, Internal data representation in computers- number systems used in computers, Character coding -BCD, EBCDIC, ASCII, Unicode

UNIT II: CPU and Memory Unit

CPU architecture-components of CPU, instruction set, register set, speed, types of processor
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, Storage interface-SCSI, SAS, SATA etc, Hierarchical storage system, Introduction to buses-data bus, address bus, control bus

UNIT III: Input and Output Devices

Input devices-KeyBoard, 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

UNIT IV: Software and Operatin System

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, Utility programs

UNIT V: Data Communication

Concepts of data and information, Data communication and transmission, Computer network and uses, LAN, MAN, WAN, Client server architecture, internet and intranet, World Wide Web, Browser, URL, Introduction to network security, Firewall

Reference Books:

1. Rajaraman V, Fundamentals of computer
2. P.K.Sinha, Foundation of computing

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Syllabus for P.G.D.C.A.

Course title: **Programming in C**
Semester: **I**

Course code: **DIT-02**
Credit: **6 (3+1+2)**

UNIT I: Introduction to computer and programming

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

UNIT II: Operators and I/O

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, error and debugging techniques

UNIT III: Control statements

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

UNIT IV: Functions and arrays

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

UNIT V: Storage classes, strings and pointers

Storage classes, automatic variables, register variables, external variables, static variables, defining and initializing a string, null character, reading and writing a string, library functions for strings, pointers, pointer declaration, passing pointer to function, pointers and one dimensional array, dynamic memory allocation, operations on pointers, pointers and multidimensional array, arrays of pointers, passing functions to other functions

UNIT VI: Structures and unions

Structure, defining a structure, processing structure, user defined data types, structure and pointers, passing structures to functions, self referential structures, union, defining a union, processing union

UNIT VII: Handling file

Files, opening and closing files, reading and writing a file, processing a file, unformatted files, binary files, random access of files

Reference book:

Byron Gottfried, Programming with C.

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Syllabus for P.G.D.C.A.

Course title: **Data Communication and Networking**
Semester: **I**

Course code: **DIT-03**
Credit: **4 (4+0+0)**

UNIT I: Introduction

Data communications, components, data representation, data flow, networks, physical structure of network, network models, categories of networks, Internetwork, Internet, protocols, standards, Sender, receiver and carrier, 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: physical and data link layers, network layer, transport layer, application layer, physical addresses, logical addresses, port addresses

UNIT II: Signals and transmission

Analog and digital data, analog and digital signals, periodic and non-periodic signals, sine wave, phase, wavelength, time and frequency domains, composite signals, bandwidth, digital signal, bit rate, bit length, digital to digital conversion, line coding, block coding, analog to digital conversion, pulse code modulation, delta modulation, parallel and serial transmission, digital to analog conversion, amplitude shift keying, frequency shift keying, phase shift keying, quadrature amplitude modulation, analog to analog conversion, amplitude modulation, frequency modulation, phase modulation

UNIT IV: Transmission media and switching

Guided media, twisted pair cable, co-axial cable, fiber-optic cable, unguided media, radio waves, micro waves, infrared, circuit switched networks, datagram networks, virtual circuit network, telephone network, dial up modems, DSL

UNIT V: Data link layer

Data link layer, types of errors, redundancy, detection versus correction, coding, block coding, hamming distance, linear block codes, cyclic codes, CRC, checksum, framing, flow control, error control, protocols, simplest protocol, stop and wait protocol, go back n protocol, selective repeat protocol

UNIT VI: Network layer

Review of physical and data link layer, IPv4 addresses, address space, notation of IP addresses, classful addressing, classless addressing, IPv6 addresses, address mapping, ARP, RARP, BOOTp, DHCP, forwarding techniques, forwarding process, unicast routing protocols, distance vector routing, link state routing, path vector routing, unicast, multicast and broadcast routing.

UNIT VII: Transport layer

Process to process delivery, client/server paradigm, multiplexing and demultiplexing, connectionless versus connection-oriented service, data traffic, congestion, congestion control, QoS, integrated services, differentiated services

UNIT VIII: Application layer

Domain name system, namespace, flat namespace, hierarchical name space, domain name space, Internet, DNS in Internet, name resolution, mapping between names and addresses, telnet, electronic mail, FTP, WWW, browser, web server, URL, cookies

Reference book:

Behrouz A. Forouzan, Data Communications and Networking

Andrew S. Tanenbaum, Computer Networks

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Syllabus for P.G.D.C.A.

Course title: **Database Management System**
Semester: **I**

Course code: **DIT-04**
Credit: **5 (3+1+1)**

UNIT I: Introduction to Databases

Database, characteristics of database approach, advantages of DBMS, when not to use DBMS, database models, database architecture and data independence, database languages, centralized DBMS, classification of DBMSs

UNIT II: Relational Data Models and SQL

Relational model concepts, relational model constraints, relational database schemas, Codd's rules, 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.

UNIT III: Relational Algebra and Calculus

Unary relational operations: SELECT and PROJECT, relational algebra operations from set theory, binary relational operations: JOIN and DIVISION, tuple relational calculus, domain relational calculus

UNIT IV: Entity Relationship Model

Database design and ER Model: overview, ER Model, Constraints, ER Diagrams, ERD Issues, weak entity sets, subclasses, superclasses, and inheritance, specialization and generalization, ER to relational model mapping

UNIT V: Dependencies and Normal Forms

Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

UNIT VI: Transaction Processing and Error Recovery

concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

Reference book:

Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems.
Avi Silberschatz, Henry Korth, S. Sudarshan, Database System Concepts.

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Syllabus for P.G.D.C.A.

Course title: **Communication and soft skill**
Semester: **I**

Course code: **DIT-05**
Credit: **2 (2+0+0)**

UNIT I: Features of Indian English

Correction of sentences, structures, tenses, ambiguity, idiomatic distortions

UNIT II: Informal and formal conversation:

Informal conversation vs formal expression, verbal and non-verbal communication, barriers to effective communication, kinesics.

UNIT III: Types of communications

Oral, aural, writing and reading, word power, vocabulary, jargon, rate of speech, pitch, tone, clarity of voice.

UNIT IV: Management presentation

Types of presentation, video conferencing, participation in meeting, chairing sessions.

UNIT V: Formal and informal interviews

Ambience and polemics- interviewing in different settings and for different purposes e.g. eliciting and giving information, recruiting, performance appraisal

UNIT VI: Letter writing

Letter writing, business letters, pro-forma- culture, style, effectiveness, promptness, analysis of sample letters collected from industry, email, fax

UNIT VII: Business and technical report writing

Types of reports, progress reports, routine reports, annual reports, analysis of sample reports from industry, synopsis and thesis writing.

Reference books:

1. Essentials of Business Communication, Rajendra Pal, JS Korlahi
2. Advanced Communication Skills, V. Prasad
3. Business Communication, R.K. Madhukar

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Syllabus for P.G.D.C.A.

Course title: **Data Structure using Object Oriented Programming**
Semester: **II**

Course code: **DIT-06**
Credit: **6 (4+0+2)**

UNIT I: Introduction

Programming paradigm, What is Object Oriented Programming, Object oriented programming vs procedure oriented programming, Basic concepts of OOP-Encapsulation, Polymorphism and Inheritance, Object oriented language, The origin of C++, Structure of C++ program, Creating the source file, Compiling and linking, Tokens, Keywords, Identifiers and constants, Basic data types, User-defined data types, Derived data types, Variables, Operators in C++, Scope resolution operators, Memory management operators, Type cast operators, Operator precedence, Control structures, Function, Function prototyping, Call by reference, Inline function, Default arguments, Const arguments, Function overloading, Friend and virtual function, Library function

UNIT II: Classes and Objects

Classes, Class and structure, Class and union, Defining member functions, Private, Public and protected member, Parameterized constructor, Static class members-static data member and static member function, Nested classes, Local classes, Passing objects to functions, Returning object, Object assignment, Arrays of objects, Pointers to objects, The this pointer, Pointer to derived type, Pointer to class members, References, Dynamic allocation operators, Constructor and Destructor, Parameterized constructor, Constructor with default argument, Execution of constructor and destructor

UNIT III: Function and Operator Overloading

Function Overloading, Overloading constructors, Copy constructors, Finding address of an overloaded function, Default function arguments, Function overloading and ambiguity
Operator overloading, Overloading nary and binary operators, Creating a member operator function, Operator overloading using a member function, Rules for overloading operators, Overloading new and delete, Overloading some special operators, Type conversions

UNIT IV: Inheritance

Defining derived class, Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical Inheritance, Hybrid Inheritance, Constructor and destructor and inheritance

UNIT V: Stack and queue

Stack, primitive operations on stack, stack as an abstract data type, implementation of push and pop operations in C, infix expression, prefix expression and postfix expressions, evaluating a postfix expression, converting an infix expression to postfix form, queue, primitive operations on queue, queue as ADT, C implementation of queue operations, priority queue.

UNIT VI: Linked list

Linked list, primitive operations on list, list implementation of stack, list implementation of queue, list as a data structure, list implementation of priority queue, array implementation of lists in C, linked lists

using dynamic allocation, circular list, stack as circular list, queue as circular list, Josephus problem, doubly linked list.

Reference books:

1. Herbert Schildt, C++: The complete Reference
2. Data structures using C and C++, Y. Langsam, M. Augenstein, A. Tanenbaum

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Syllabus for P.G.D.C.A.

Course title: **Web Technology**
Semester: II

Course code: **DIT-07**
Credit: **4 (2+1+1)**

UNIT I: Introduction

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

UNIT II: World Wide Web

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, Web security

UNIT III: Markup Language

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

UNIT IV: Web Programming

Scripting language, Client Side Scripting Language and Server Side Scripting Language, Writing Java Script, VB Script, Java Applet, DOM (Document Object Model), Writing Server Side Script in PHP, ASP JSP

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Syllabus for P.G.D.C.A.

Course title: **Software Engineering**
Semester: II

Course code: **DIT-08**
Credit: **3 (3+0+0)**

UNIT I: Introduction

Why study Software Engineering, Evolution and Impact of Software Engineering, Software Development Projects, Programs vs Products, Emergence of Software Engineering -Early Computer Programming, High-Level Language Programming, Control Flow- Based Design, Data-Structure-Oriented Design, Data Flow-Oriented Design, Object-Oriented Design

UNIT II: Software Life Cycle Models

Use of Life Cycle Model, Classical Waterfall Model, Iterative Waterfall Model, Prototyping Waterfall Model, Evolutionary Model, Spiral Model , Comparisons of different Life Cycle Models

UNIT III: Software Project Management

Responsibility of a Software Project Manager, Project Planning, Matrices for Project Size Estimation: LOC, Function Point Metric, Project Estimation Technique-Empirical Estimation Technique, Heuristic Technique, Analytical Estimation Technique, COCOMO Model, Scheduling -Work Breakdown Structure, Activity Networks and Critical Path Model, Gantt Charts, PERT charts, Project Monitoring and Control, Organization Structure and Team Structure, Staffing, Risk Management- Risk Identification, Risk Assessment, Risk Containment ,Software Configuration Management

UNIT IV: Requirement Analysis and Specification

Requirement Gathering and Analysis, Software Requirement Specification, Characteristics of a good SRS Document, Functional Requirement, Traceability, Algebraic Specification

UNIT V: Software Design

Classification of Design Activities and Design Methodologies, Analysis versus Design, Cohesion and coupling, Functional Independence ,Approaches to Software Design -Function -Oriented Design, Object-oriented Design,

Function -Oriented Design: Structured Analysis, Data Flow Diagrams (DFD s), Structured Design-Flow Chart versus Structure Chart, Transformation of a DFD Model into Structured Chart, Design Review,

Object-oriented Design: Object Modeling using UML, UML Diagrams, Use Case Model, Class Diagrams, Interaction Diagrams, Activity Diagrams, State Chart Diagrams, Package and Deployment Diagrams, An Object-Oriented Analysis and Design Methodology-The Unified Process, Use Case Model Development, Domain Modeling, Identification of Entity Objects, Booch's Object Identification Method

User Interface Design: Characteristics of a good user interface, User Guideline and online Help, Graphical User Interface vs Text-Based User Interface, Types of User Interface -Command Language-based Interface, Menu-based Interface, Window system, Types of Widgets

UNIT VI: Coding and Testing

Coding Standards and Guideline, Code Review-Code Walkthrough, Code Inspection, Clean Room Testing, Software Documentation, Testing-designing test cases, Testing in the Large vs Testing in the

small, Unit Testing-Driver and Stub Modules, Black-Box Testing-Equivalence Class Partitioning, Boundary Value Analysis, White Box Testing-Statement Coverage, Branch Coverage, Conditional Coverage, Path Coverage, McCabes Cyclomatic Complexity Metric, Data Flow-based Testing, Mutation Testing, Debugging, Program Analysis Tool, Integration Testing, System Testing-Performance Testing, Error Seeding ,Regression Testing

UNIT VII: Software Reliability and Quality Management

Hardware vs Software Reliability, Statistical Testing, Software Quality Management System- Product Metrics vs Process Metrics, ISO 9000,SEI Capability Maturity Model

UNIT VIII: Software Maintenance and Software Reuse

Characteristics of Software Maintenance, Software Reverse Engineering, estimation of Maintenance Cost, Software Reuse-basic issues in any Reuse Program, A Reuse Approach-Domain analysis, Component classification, Searching, Repository Maintenance, Reuse without Modification, Reuse at Organization level

Reference Book:

Fundamentals of Software Engineering by Rajib Mall

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Syllabus for P.G.D.C.A.

Course title: **Operating System**
Semester: II

Course code: **DIT-09**
Credit: **4 (3+1+0)**

UNIT I: Basics

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

UNIT II: Process Management

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

UNIT III: Memory Management

Swapping, Contiguous Memory Allocation, Paging Structure of the Page Table Segmentation Example: The Intel Pentium, Virtual memory, Demand Paging, Page Replacement, Thrashing, Memory Mapped Files, Allocation of Kernel Memory.

UNIT IV: File Systems

Contiguous, Sequential and Indexed Allocation, File system interface, File System implementation, Case study of Unix File system - Buffer Cache, Inodes, The system calls - ialloc, ifree, namei, alloc and free, Mounting and Unmounting files systems, Network File systems.

UNIT V: I/O System

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

Reference book:

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts.
Maurice Bach, Design of the Unix Operating System.

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Syllabus for P.G.D.C.A.

Course title: **Project**
Semester: II

Course code: **DIT-10**
Credit: **20**

Students are required to carry out a project where they will apply the knowledge acquired so far to address a problem from corporate or research & development domain. Based on domain the projects can be classified into two categories.

1. Application Development: Students will develop online or offline GUI based deployable applications.
2. Research & Development: Students will review and analyze a computational research problem and they will try to propose a solution of the problem.