TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

## 3-Year Diploma Engineering Curriculum and Syllabus for Computer Science & Engineering (CSE)

# Fifth Semester

| Course Code | Course Title | Contact Hrs. / Week | | | Credit |
|---|---|---|---|---|---|
| | | L | T | P | |
| **Theory** | | | | | |
| TIUSD-501 | Career Advancement Skill Development-V | 2 | 1 | 0 | 3 |
| TIUDCS-502 | Theory of Computer Science and Automata | 2 | 1 | 0 | 3 |
| TIUDCS-503 | Computer Architecture | 2 | 1 | 0 | 3 |
| TIUDCS-504 | Object Oriented Methodologies | 2 | 0 | 0 | 2 |
| TIUDCS-505 | Operating Systems | 2 | 0 | 0 | 2 |
| TIUDCS-506 | Database Management System | 2 | 0 | 0 | 2 |
| TIUDCS-507 | Introduction to microprocessors & Interfacing | 2 | 0 | 0 | 2 |
| **Practical** | | | | | |
| TIUDCS-594 | Object Oriented Programming Lab (C++) | 0 | 0 | 2 | 2 |
| TIUDCS-595 | Operating Systems Lab | 0 | 0 | 2 | 2 |
| TIUDCS-596 | Database Management System Lab | 0 | 0 | 2 | 2 |
| TIUDCS-597 | Microprocessor Lab | 0 | 0 | 2 | 2 |
| TIUDCS-598 | CST Project work | 0 | 0 | 2 | 2 |
| **Sessional** | | | | | |
| TIUCSL-581 | Entrepreneurship Skill Development-V | 0 | 0 | 2 | 2 |
| **Total Credits** | | | | | 29 |

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# SYLLABUS

## Theory of Computer Science and Automata
## TIUDCS-502

**: 2-1-0** **Credit: 3**

**Mathematical Preliminaries**
Sets, Relations and Functions (Brief Discussion), Graphs,
Trees. ,Strings and their properties: Definition, operation on strings, palindrome, prefix & suffix of a string, Levi theorem (Statement only), Terminal & Non-terminal symbols.

**The Theory of Automata**
Definition of an Automaton, Definition of finite Automaton, Block diagram of finite Automaton, Transition system, Properties of Transition Functions, Acceptability of a string by Finite Automaton. Definition of DFA and NDFA, The equivalence of DFA and NDFA. Mealy and Moore machine.

**Formal Language**
Concept of a language, Definition of a grammar, Language generated by a grammar (definition with application). Chomsky classification of languages (definition), Relation between the classified languages. Recursive and recursively enumerable set (definitions).

**Regular Sets & Regular Grammar**
Definition of Regular expression and regular set, Identities of regular expressions
Relation between regular expression and finite automata, Transition system contain
Ing /\moves (application), Conversion of Non-deterministic systems to deterministic system(application), Construction of finite automata equivalent to a regular expression (with application)

**Context -Free LANGUAGES & Pushdown Automata**
Introduction –Definition - Derivation trees (Definitions & application) –Ambiguity in CFG, Basic definition of PDA

**Reference books**

1. Introduction to Automata Theory, languages & computation / J.E. Hopcroft& J.D. Ulman / Narosa
2. Theory of Computer Science / K.L.P. Mishra & N. Chandrasekharan / PHI
3. Theory of Automata and Formal Language / Kain / TMH
4. Switching and Finite Automata / Z.V.I. Kohavi / TMH.

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**Computer Architecture**
**TIUDCS-503**

**: 2-1-0** **Credit: 3**

**Introduction**
Arithmetic with signed magnitude data: Addition, Subtraction, Multiplication, Division.
Hardware implementation and algorithm: Addition, Subtraction, Multiplication, Division.
Floating point arithmetic operation: Basic consideration, Register Configuration, Addition, Subtraction, Multiplication and Division.

**Control unit**
Hardware Control with an example. Micro programmed Control-Control Memory, Computer Configuration

**Central processing unit**
Stack organization: Register Stack, Memory Stack, Revised Polish Notation, Evaluation of Arithmetic Expression; Introduction to Register Transfer Language(RTL)
Interrupts: S/W and H/W Interrupts, Vectored and Non-Vectored Interrupts, Priority Interrupts, Interrupts Handling, RISC and CISC Architecture.

**Pipeline & vector processing**
Parallel Processing, Pipelining : General consideration, Arithmetic Pipeline, Instruction Pipeline (with example), RISC Pipeline (with example), Vector Processing: Vector operation, Matrix multiplication, Memory interleaving. Array Processor: SIMD Array processor, Problems

**Input output organization**
I/Ointerface: I/O Bus and Interface Modules, I/O versus Memory Bus, Isolated versus Memory-Mapped I/O, Example of I/O Interface.
Input-output processor: CPU-IOP Communication.

**Memory organization**
Cache memory: Associative mapping, Direct mapping, Set-associative mapping, Writing into Cache, Cache Initialization, Cache level 1, level 2.
Virtual memory: Address space and Memory space; Address mapping using Pages, Associative memory page table, Page replacement.

**Reference books**

1. Computer System Architecture / M. Morris Mano / Pearson Education.

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**Object Oriented Methodologies**
**TIUDCS-504**

**: 2-0-0** **Credit: 2**

**Group A – Introduction to C++**

**Introduction to OOP:** OO Paradigm, Objects and Classes, Features Object oriented Programming, Structured vs Object Oriented Development, Features of OO Languages, Applications of OOP, Merits and Limitations of OOP.

**Data types, Operators and I/O Operation:** Basic Data types, Basic type modifiers, Derived Data types, Variables, Storage class specifiers, Initializing variables, Operators, Unformatted Console and stream I/O Functions, Formatted Console I/O Functions.

**Classes and Objects:** Classes, Class Members and Creating Objects, Member functions, Member Access Specifiers (public, private, protected), Static class member, Inline Functions, Arrays within a Class and Array of Objects, Passing Objects as function arguments and returning object from a function

**Constructors and Destructors:** Constructors, Overloaded Constructors, Null Contradictor, Copy Constructor, Destructors Constraints on Constructors and Destructors

**Overloading Functions and Operators:** Overloading Functions, Overloading Operators (Unary, binary, string manipulation using operator)

**Group B**

**Inheritance:** Base and Derived classes, Accessing Base class members and Access Control,

**Overriding:** Member functions, Multi-Level, Multiple, Hierarchical& Hybrid Inheritance, Virtual Base Class

**Polymorphism:** Fundamental of Polymorphism, Pointer to object and derived class, 'This' pointer, Virtual Functions, Early and Late Binding, Rules of Virtual Functions, Pure Virtual Function, Friend Functions

**File Handling:** Basic File Operations, File Handling, Classes for file stream operation, Opening and Closing Files, File modes.

**Exception Handling & Templates:** Introduction to Exception Handling, Catching Class Types, Multiple Catch Handlers, Exception Specification, Generic Functions/Function Templates, Template Arguments

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**Reference books**

1. E. Balaguruswami, Objected Oriented Programming with C++, TMH
2. Robart Lafore, Object Oriented Programming in Microsoft C++,.
3. Y Kanethkar, Let Us C++, BPB Publications.

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**Operating Systems**
**TIUDCS-505**

**L-T-P: 2-0-0** **Credit: 2**

## Module 1 Introduction

An Introduction to Operating System & its Services
Various Types of Operating Systems
Operating System Structure
Concepts of**:** Process – Files – System Calls – Interrupt – Shell

## Module 2 Process Management

An Introduction to process; Process State & Transition
Process Control Block, Process Context, Context Switch
Process Scheduling (Pre-emptive & Non-Pre-emptive Algorithms)
(a) FCFS (First Come First Serve) Algo;
(b) Shortest Job First;
(c) Priority Scheduling;
(d) Round Robin Scheduling.
Performance Criteria of Scheduling Algorithm
(a) CPU Utilization;
(b) Throughput;
(c) Turnaround Time;
(d) Waiting Time;
(e) Response Time.
Overview of**:** Inter-process Communication – Race Condition – Critical Section – Semaphore

## Module 3 Memory Management

Partitioned Memory Management (Static & Dynamic)
Concept of Fragmentation & Compaction
Paging & Demand Paging
Page Replacement Algorithms (FIFO, Optimal, LRU Algorithms)

## Module 4 Deadlock

Introduction to Deadlock
Necessary Condition for Deadlock
Method for Handling Deadlock
(a) Brief Overview of Deadlock Prevention;

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(b) Deadlock Avoidance (Banker's Algorithm);
(c) Deadlock Detection & Recovery.

**Module 5 File Management**

File Concepts – Types of Files – File Attributes – File Operations
Access Methods: Sequential access – Random access
Hierarchical Directory System

**Module 6 Device Management**

Device drivers
I/O systems– Blocking and non-blocking I/O
Device driver implementation

**Reference books**

1. Operating System Design & Implementation / Andres's Tanenbaum / Prentice Hall of India, N. Delhi
2. Operating Systems / Stuart E Mandnick& John J Donovan / McGraw-Hill
3. Systems Programming / Srimanta Pal/ Oxford University Press

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**Database Management System**
**TIUDCS-506**

**: 2-0-0** **Credit: 2**

**Module 1 Basic Concepts of DBMS**

Purpose of database systems – Data abstraction – Database Users – Data Independence (Logical & Physical) – Instance & Schemes – Data Dictionary – Three layered Architecture of DBMS.

**Module 2 Data Models**

Logical models**:** Object & Record based – Object oriented model – Entity relationship models – Entity sets & relationships sets – Attributes — Keys in entity & relationship sets**:** (a) super key, (b) candidate key, (c) primary key, (d) unique key — Mapping constraints – E-R Diagrams – Relational Model – Hierarchical model – Network Model.

**Module 3 Relational Database**

Data definition language – Data manipulation language – Relational algebra — Operators: select, project, join, renameetc – Simple examples.

**Module 4 Structured Query Language**

Give elementary idea of Structured Query Language – Queries in SQL – Queries to create, insert, update, select in SQL.

**Module 5 Normalization in Relation System**

Pitfalls in relation databases – Functional Dependencies – Lossless join and Dependency Preservation –Importance of normalization – $1^{st}$ NF, $2^{nd}$ NF, $3^{rd}$ NF and comparison with each other – BCNF – Multi-valued Dependency & $4^{th}$ NF (Elementary idea).

**Module 6 Transaction Processing Concepts**

Transaction processing – Transaction & System Concepts – Desirable properties of transaction – Schedules & Recoverability.

**Module 7 Concurrency Control Concepts**

Basic concepts of concurrency control – Concepts of locks – Live Lock – Deadlock – Serializability (only fundamentals).

**Module 8 Security & Integrity**

Authorization and View – Security constraints – Integrity Constraints – Encryption.

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**Reference books**

1. An Introduction to Database Systems / C.J. Date
2. Database System Concepts / A. Silberschatz& H.F. Korth
3. Database Concepts and Systems / Ivan Bayross / SPD
4. Fundamental of Database System / R. Elmashri& S.B. Navathe.

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**Introduction to Microprocessors & Interfacing**
**TIUDCS-507**

**: 2-0-0** **Credit: 2**

**GROUP–A**

**Introduction to microprocessors**

Evolution of microprocessors; Specific features of microprocessors, Application of microprocessors.

**Architecture of microprocessors**

Explanation of each Functional Block Diagram and Internal Architecture of 8085, 8086
ALU, Registers, Control unit, Clocks, Bus Structure; Address, Data and Control Bus of 8085, 8086; pin DIAGRAM of 8085, Introduction to PC range of Microprocessors & Case studies.

**GROUP–B**

**Programming of microprocessors**

Different Addressing modes, Instruction Cycle of 8085 (including subroutine calls, jumping, comparing); Timing Diagram of different parts of Instruction Cycles; Solving basic problems of Assembly Language Programming using 8085, Interrupts - Hardware and Software interrupts, Interrupt vector.

**Memory and I/O**

Address Space; Memory mapped I/O, I/O mapped I/O; address Decoding and Interfacing of Memory; DMA, A brief overview of BIOS
Interrupts

**Reference books**

1. Microprocessor Architecture, Programming and Applications – Ramesh S Goonkar.
2. Microprocessors and Interfacing – Douglas V Hall
3. Fundamentals of Microprocessors and Microcomputers – B Ram.

Advances Microprocessors and interfacing – B Ram.

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**Object Oriented Programming Lab (C++)**
**TIUDCS-594**

**: 0-0-2** **Credit: 2**

Recap of C++ concepts common to C including Expressions & variables, Arithmetic operators, Input and output statements, Basic data types, Assignment statements, Constants, Pre-defined functions, if, switch statements, Comparison/logic operators, Nesting control structures, Iteration: for, while, do-while statements break, continue
Functions - Prototypes, arguments (default values), return types, return statement, Function overloading, variable scope, Pass-by-value and pass-by-reference, Recursion/program stack, inline functions, file input/output
Object-oriented programming - Programming paradigms (procedural, functional, logic, object-oriented), The General concepts of object-oriented paradigm, General concepts of encapsulation, inheritance, polymorphism/dynamic binding, The C++ class: Classes vs. instances, Data members,

Member functions (inspectors, mutators & facilitators), Encapsulation (private and public members), Constructors and destructors (& copy constructors), Static class members & static member functions, Composition, Operator overloading, Templates
Inheritance - Class derivation (& protected members), Single and multiple inheritance, Inheritance vs. composition, Virtual functions (polymorphism and dynamic binding, virtual destructors), Virtual base classes

**References:**

1. Object-Oriented Programming in *C++*, *Robert Lafore*

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**Operating Systems Lab**
**TIUDCS-595**

**: 0-0-2** **Credit: 2**

## GROUP – A WINDOWS – NT/2000

### Module 1 Overview Of Windows – NT / 2000

i) NT / 2000 Features, NT / 2000 Capabilities - Multitasking, Multithreading, Multiprocessor Support.
ii) NT / 2000 File System, Client/Server Model.

### Module 2 Windows NT / 2000 Basics

i) Starting & Quitting Windows NT / 2000
ii) Viewing Contents Of Your System
iii) Opening, Closing, Switching Between Programs
iv) Organizing Files & Folders
v) Installing Software Programs.

### Module 3 Windows Installation

i) NT / 2000 Hardware Requirements.
ii) NT / 2000 Server Installation & Configuration.
iii) NT / 2000 Workstation Installation & Configuration.

### Module 4 NT / 2000 Administration

i) Creating a New User , Adding an Account to a Group
ii) Creating permission for a system resources.
iii) Using Task Manager.
iv) Compressing & Uncompressing Disk.
v) Using Event Viewer: (a) application log, (b) security log.
vi) Using Performance Monitor.

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**GROUP – B U N I X**

**Module 5 Overview of Unix**

UNIX as an operating system – Kernel – Shell – User – UNIX File System – Files & Directory – File System Hierarchy.

**Module 6 Basic UNIX Commands**

i) Listing Files & Directories.
ii) Copying, Deleting, Renaming, Comparing, Splitting, Linking Files.
iii) Creating, Navigating, Removing Directories.
iv) Setting Access permission of files & directories.
v) Using VI editor of UNIX.
vi) Paging & Printing Files.
vii) Status of users terminals & setting terminal Characteristics.
viii) Cutting, Pesting, Sorting of Files.
ix) Searching for a pattern in string.
x) Process Status, Process Killing

**Module 7 System Administration**

i) Adding & Modifying Users accounts, Controlling Password.
ii) Creating & Mounting File System.
iii) init process & inittabstartup files, Run levels.
iv) Managing Disk Space(df , du , cpio)
v) Searching Files with find command
vi) Using ftp protocol to move files between computers.
vii) 'Shutdown' command.

**Module 8 Shell Programming**

i) Shell Script
ii) System variables & shell variables.
iii) Shell termination.
iv) Looping statements; conditional statements; case statements.
v) Logical operators, Mathematical expression.
vi) Command line parameters – Positional parameters.
vii) String handling.

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**Database Management System Lab**
**TIUDCS-596**

**: 0-0-2** **Credit: 2**

**Introduction to Oracle**

Introduction to oracle — Various Data types — Creating Tables, Modifying structure of tables — Inserting, Updating, Deleting table data — Many faces of SELECT command — Data Constraints — Logical operators, Range Searching , Pattern Matching, Oracle Function — Grouping data from tables — Views — Joins: Equi-Join, Self-Join.

**Understanding Pl / SQL**

Introduction to PL/SQL — PL/SQL Syntax and PL/SQL execution environment — Variables and Various Data types — Understanding PL/SQL block structure — Error Handling in PL/SQL: (a) user defined error condition, and, (b) pre-defined internal PL/SQL exception — Introduction to cursor — Cursor Control: open, fetch, close statements — Implicit & Explicit cursor and their attributes.

**Working with Forms**

Basic Components of Form — Understanding Block, Item, Frame, Canvas View, Window, PL/SQL Code — Form construction, Default Form, Customizing Form layout — Standard data retrieval and data manipulation operation using form — Understanding and using Triggers and user-defined procedure — Form data validation — Context sensitive help — Constructing master-detail form — Using LOV and list items — Working with Multiple Canvases — Passing parameter between forms.

**Working with Menu**

Components of custom menu — Creating custom menu & menu module — Attaching PL / SQL code to menu items — Saving & Compiling a menu module — Attaching menu module to form module.

**Working with Report**

Basic Concepts — Using Oracle report interface — Creating default tabular report — Customizing report layout — Familiarity with Break & Matrix report.

**Reference books**

1. ORACLE DEVELOPER 2000 / Ivan Bayross.

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**Microprocessor Lab**
**TIUDCS-597**

**L-T-P: 0-0-2** **Credit: 2**

**Job 1** To be acquainted with the Microprocessor Trainer Kit; Hardware and User's commands.

**Job 2** Assembly language program development ; Data transfer program – Register to Register, Register to Memory and vice-versa: Arithmetic operation-8 bit addition and subtraction, multi-byte addition and subtraction, BCD addition and subtraction, multiplication using repeated additions, multiplication using shift-add process, signed multiplication, Binary division, BCD division.

**Job 3** Sorting and searching; block movement; ordering of a collection of data.

**Job 4** Look-up table – finding squares, cubes etc. of a number using look-up table; code conversion using look-up table.

**Job 5** To develop the above program using a subroutine in a main program, delay routine.

**Job 6** Input / Output programming 8255 with the basic I/O modes programming; to store the sample data of any analog signal using ADC and 7-segmen display using 8255 as a port; to design a thermometer using AD590, 0808, seven segment display, micro-processor kit.

**Job 7** Programming in 8086 using Debug programme: (i) Block move, Searching, Sorting; (ii) Port I/O (LPT1); (iii) Disk file accessing: (iv) Graphics text mode and Graphics mode.

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