

Scheme & Syllabus of

Bachelor of Technology

Information Technology

**Batch 2018 onwards
(3rd -8th Sem.)**



Department of Academics

IK Gujral Punjab Technical University

Bachelor of Technology in Information Technology

It is a Graduate (UG) Programme of 4 years duration (8 semesters)

Courses & Examination Scheme:

Third Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTES 301-18	Engineering Science Course	Digital Electronics	3	0	0	40	60	100	3
BTIT 301-18	Professional Core Courses	Data structure & Algorithms	3	0	0	40	60	100	3
BTIT 302-18	Professional Core Courses	Object Oriented Programming	3	0	0	40	60	100	3
BTAM 304-18	Basic Science Course	Mathematics-III	3	0	0	40	60	100	3
BTES 302-18	Engineering Science Course	Computer Architecture	3	0	0	40	60	100	3
BTES 303-18	Engineering Science Course	Digital Electronics Lab	0	0	2	30	20	50	1
BTIT 303-18	Professional Core Courses	Data structure & Algorithms Lab	0	0	4	30	20	50	2
BTIT 304-18	Professional Core Courses	Object Oriented Programming lab.	0	0	4	30	20	50	2
BTIT 305-18	Professional Core Courses	IT Workshop*	0	0	2	30	20	50	1
		Summer Institutional Training	0	0	0	0	0	0	Satisfactory/Unsatisfactory
Total			15	0	12	320	380	700	21

* Syllabus to be decided by respective institute internally. It may include latest technologies.

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Fourth Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTES 401-18/ BTCS401-18	Professional Core Courses	Discrete Mathematics	3	1	0	40	60	100	4
BTIT 401-18	Professional Core Courses	Computer Networks	3	0	0	40	60	100	3
BTIT 402-18	Professional Core Courses	Operating Systems	3	0	0	40	60	100	3
BTIT 403-18	Professional Core Courses	Design & Analysis of Algorithms	3	0	0	40	60	100	3
HSMC 101/102- 18	Humanities & Social Sciences including Management Courses	Development of Societies/ Philosophy	2	1	0	40	60	100	3
EVS101- 18	Mandatory Courses	Environmental Sciences	2	-	-	100	-	100	S/US
BTIT 404-18	Professional Core Courses	Computer Networks Lab	0	0	2	30	20	50	1
BTIT 405-18	Professional Core Courses	Operating Systems Lab	0	0	4	30	20	50	2
BTIT 406-18	Professional Core Courses	Design & Analysis of Algorithms Lab	0	0	4	30	20	50	2
Total			14	2	10	290	360	650	21

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Fifth Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT 501-18	Professional Core Courses	Formal Language & Automata Theory	3	0	0	40	60	100	3
BTIT 501-18	Professional Core Courses	Database Management Systems	3	0	0	40	60	100	3
BTIT 502-18	Professional Core Courses	Programming in Java	3	0	0	40	60	100	3
BTIT 503-18	Professional Core Courses	Software Engineering	3	0	0	40	60	100	3
HSMC12 2-18	Humanities & Social Sciences including Management Courses	Universal Human values-2	3	0	0	40	60	100	3
BTIT XXX-18	Professional Elective	Elective-I	3	0	0	40	60	100	3
MC	Mandatory Courses	Constitution of India/ Essence of Indian Traditional Knowledge	2	-	-	100	-	100	S/US
BTIT 504-18	Professional Core Courses	Database Management Systems Lab	0	0	4	30	20	50	2
BTIT 505-18	Professional Core Courses	Programming in Java Lab	0	0	2	30	20	50	1
BTIT XXX-18	Professional Elective	Elective-I lab	0	0	2	30	20	50	1
Total			18	0	8	330	420	750	22

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Sixth Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT 601-18	Professional Core Courses	Big Data	3	0	0	40	60	100	3
BTIT 602-18	Professional Core Courses	Web Technologies	3	0	0	40	60	100	3
BTIT YYY-18	Professional Elective Courses	Elective-II	3	0	0	40	60	100	3
BTIT ZZZ-18	Professional Elective Courses	Elective-III	3	0	0	40	60	100	3
BTOE ***	Open Elective Courses	Open Elective-I (Humanities)	3	0	0	40	60	100	3
BTIT 603-18	Project	Project-1	0	0	6	60	40	100	3
BTIT 604-18	Professional Core Courses	Big Data Lab	0	0	2	30	20	50	1
BTIT 605-18	Professional Core Courses	Web Technologies Lab	0	0	2	30	20	50	1
BTIT YYY-18	Professional Elective Courses	Elective-II lab	0	0	2	30	20	50	1
BTIT ZZZ-18	Professional Elective Courses	Elective-III lab	0	0	2	30	20	50	1
Total			15	0	14	380	420	800	22

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Seventh Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT UUU-18	Professional Elective Courses	Elective-IV	3	0	0	40	60	100	3
BTIT VVV-18	Professional Elective	Elective-V	3	0	0	40	60	100	3
BTOE ***	Open Elective Courses	Open Elective-II	3	0	0	40	60	100	3
BTIT 701-18	Professional Core Courses	Software Testing and Quality Assurance	3	0	0	40	60	100	3
BTIT 702-18	Project	Project-II	0	0	8	100	50	150	4
BTIT UUU-18	Professional Elective Courses	Elective-IV lab	0	0	2	30	20	50	1
BTIT VVV-18	Professional Elective Courses	Elective-V lab	0	0	2	30	20	50	1
BTIT 703-18	Professional Training	Industrial *Training	-	-	-	60	40	100	2
Total			12	0	12	380	370	750	20

* The students will take 6-8 weeks summer training in Industry after semester 6th.

Eighth Semester

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT XXX-18	Professional Elective Courses	Elective-VI	3	0	0	40	60	100	3
BTOE ***	Open Elective Courses	Open Elective- III	3	0	0	40	60	100	3
BTOE ***	Open Elective Courses	Open Elective- IV	3	0	0	40	60	100	3

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BTIT 801-18	Project	Project-III	0	0	10	100	50	150	5
BTIT XXX-18	Professional Elective Courses	Elective-VI lab	0	0	2	30	20	50	1
Total			9	0	12	250	250	500	15

LIST OF ELECTIVES

Elective-I

- BTIT 506-18** E-Commerce
- BTIT 507-18** Cyber Laws and IPR
- BTIT 508-18** Computational Biology
- BTIT 509-18** Artificial Intelligence
- BTIT 510-18** E-Commerce Lab
- BTIT 511-18** Cyber laws and IPR lab
- BTIT 512-18** Computational Biology lab
- BTIT 513-18** Artificial Intelligence lab

Elective-II

- BTIT 606-18** Fundamentals of Virtualization
- BTIT 607-18** Distributed Systems
- BTIT 608-18** Machine Learning
- BTIT 609-18** Agile Software Development
- BTIT 614-18** Fundamentals of Virtualization lab
- BTIT 615-18** Distributed database Systems lab
- BTIT 616-18** Machine Learning lab
- BTIT 617-18** Agile Software Development lab

Elective-III

- BTIT 610-18** Cryptography and Network Security
- BTIT 611-18** Management Information System
- BTIT 612-18** Digital Image Processing
- BTIT 613-18** Cloud Computing
- BTIT 618-18** Cryptography and Network Security lab
- BTIT 619-18** Management Information System lab
- BTIT 620-18** Digital Image Processing lab
- BTIT 621-18** Cloud Computing lab

Elective-IV

- BTIT 702-18** Software Project Management
- BTIT 703-18** Distributed Operating System
- BTIT 704-18** Soft Computing
- BTIT 705-18** Human Computer Interaction
- BTIT 710-18** Software Project Management LAB
- BTIT 711-18** Distributed Operating System LAB
- BTIT 712-18** Soft Computing LAB
- BTIT 713-18** Human Computer Interaction LAB

Elective-V

- BTIT 706-18** Data Mining
- BTIT 707-18** Ad-Hoc and Sensor Networks
- BTIT 708-18** Speech and Natural Language Processing
- BTIT 709-18** Network Programming
- BTIT 714-18** Data Mining lab
- BTIT 715-18** Ad-Hoc and Sensor Networks lab
- BTIT 716-18** Speech and Natural Language Processing lab
- BTIT 717-18** Network Programming lab

Elective-VI

- BTIT 802-18** Internet of Things
- BTIT 803-18** Real Time Systems
- BTIT 804-18** Data Analytics
- BTIT 805-18** Modelling and Simulation

- BTIT 806-18** Internet of Things lab
- BTIT 807-18** Real Time Systems lab
- BTIT 808-18** Data Analytics lab
- BTIT 809-18** Modelling and Simulation

LIST OF OPEN ELECTIVES

Open Elective-I

1. Soft skills and interpersonal communication
2. Cyber law and ethics
3. Human resource development and organizational behavior
4. Economics policies in India

Open electives offered by the department:

Courses of odd semesters:

BTIT301-18 Data Structures & Algorithms

BTIT503-18 Object Oriented Programming

BTIT501-18 Database Management System

Courses of even semesters:

BTES401-18 Computer Architecture

BTIT402-18 Operating System

BTIT602-18 Computer Networks

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LIST OF COURSES FOR HONOURS DEGREE

In order to have an Honours degree, a student choose 18-20 credits from the following courses in addition.

Course Code	Type of courses	Course Title	Hours per Week			Marks Distributions		Total Marks	Credits
			L	T	P	Internal	External		
BTIT H01-18	Professional Elective Courses	Graph Theory	3	0	0	40	60	100	3
BTIT H02-18	Professional Elective Courses	Computer Graphics	3	0	0	40	60	100	3
BTIT 611-18	Professional Elective Courses	Digital Signal Processing	3	0	0	40	60	100	3
BTIT H03-18	Professional Elective Courses	Software Project Management	3	0	0	40	60	100	3
BTIT H04-18	Professional Elective Courses	Parallel Computing	3	0	0	40	60	100	3
BTIT H05-18	Professional Elective Courses	Optimization Techniques	3	0	0	40	60	100	3
BTIT 804-18	Professional Elective Courses	Data Analytics	3	0	0	40	60	100	3
BTIT 608-18	Professional Elective Courses	Business Intelligence	3	0	0	40	60	100	3
BTIT H06-18	Professional Elective Courses	ICT in Agriculture and Rural Development	3	0	0	40	60	100	3
BTIT H07-18	Professional Elective Courses	Semantic Web	3	0	0	40	60	100	3
BTIT H08-18	Professional Elective Courses	Bio Informatics	3	0	0	40	60	100	3

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BTIT H09-18	Professional Elective Courses	Advanced Algorithms	3	0	0	40	60	100	3
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**MINOR DEGREE IN INFORMATION TECHNOLOGY(Credits required 20 from
Core+Electives/MOOCs*)**

List of Core Courses:Minimum of 2 courses must be opted, other than studied in regular course

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT30 1-18 & BTIT30 3-18	PCC	Data structure and Algorithms Theory & Lab	3	0	4	40T+30 P	60T+20 P	150	5
BTIT30 2-18 & BTIT30 4-18	PCC	Object Oriented Programming Theory & Lab	3	0	4	40T+30 P	60T+20 P	150	5
BTIT40 1-18 & BTCS40 4-18	PCC	Computer networks Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT40 2-18 & BTIT40 5-18	PCC	Operating system Theory & Lab	3	0	4	40T+30 P	60T+20 P	150	5
BTES30 2-18	ESC	Computer Organisation	3	0	0	40	60	150	3
BTIT50 1-18 & BTIT50 4-18	PCC	Database Management system Theory & Lab	3	0	4	40T+30 P	60T+20 P	150	5

- *List of Courses through MOOCs will be provided every six months through BOS/ MOOCs Coordinator; each course must be of minimum 12 weeks and of 4 credits after submission of successful exam in that course.

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List of Electives: 3 courses can be opted, other than studied in regular course

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT50 9-18 & BTIT51 3-18	ELECTIVE	Artificial Intelligence Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BIT608- 18 & BTIT61 6-18	ELECTIVE	Machine Learning Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT61 3-18 & BTIT62 1-18	ELECTIVE	Cloud computing Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT50 6-18 & BTIT51 0-18	ELECTIVE	Ecommerce Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT80 4-18 & BTIT80 8-18	ELECTIVE	Data Analysis Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT61 1-18 & BTIT61 9-18	ELECTIVE	Management Information System Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT70 6-18 & BTIT71 4-18	ELECTIVE	Data Mining Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT80 2-18 & BTIT80 6-18	ELECTIVE	Internet of Things Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT70 4-18 & BTIT71 2-18	ELECTIVE	Soft Computing Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4

Third Semester

Course Code: BTIT301-18	Course Title: Data Structure & Algorithms	3L:0T:P	3Credits
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Detailed Contents:

Module 1: Introduction

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

[6 hrs] (CO1)

Module 2: Stacks and Queues

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

[10 hrs] (CO2, CO4, CO5)

Module 3: Linked Lists

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: All operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

[10 hrs] (CO2, CO4, CO5)

Module 4: Sorting and Hashing

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

[10 hrs] (CO3)

Module 4: Graph

Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

[6 hrs] (CO2, CO4)

Course Outcomes:

The student will be able to:

1. For a given algorithm student will be able to analyze the algorithms to determine the time and computation complexity and justify the correctness;
2. Student will be able to handle operation like searching, insertion, deletion, traversing on various Data Structures and determine time and computational complexity;
3. Student will be able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity;
4. Students will be able to choose appropriate Data Structure as applied to specific problem definition; &
5. Demonstrate the reusability of Data Structures for implementing complex iterative problems.

Suggested Books:

1. "Classic Data Structures", Samanta and Debasis, 2nd edition, PHI publishers.
2. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
3. "Data Structures with C (Schaum's Outline Series)", Seymour Lipschutz, 1st edition, McGraw Hill Education.

Reference Books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

Course Code: BTIT302-18	Course Title: Object Oriented Programming	3L:0T:0P	3Credits
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Pre-requisites: Programming in C

Detailed Contents:

Module 1: Introduction

Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & function components, recursive functions, user -defined types, function overloading, inline functions, Classes & Objects – I: classes, Scope resolution operator, passing objects as arguments, returning objects, and object assignment.

[8 hrs] (CO1)

Module 2: Classes & Objects –II

Constructors, Destructors, friend functions, Parameterized constructors, Static data members, Functions, Arrays of objects, Pointers to objects, this pointer, and reference parameter,

Dynamic allocation of objects, Copyconstructors, Operator overloading using friend functions, overloading. **[8 hrs] (CO1, CO2)**

Module 3: Inheritance

Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes.

[8 hrs] (CO3, CO4)

Module 4: Virtual functions, Polymorphism

Virtual function, calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, Abstract classes, Using virtual functions, Early and late binding.

[8 hrs] (CO3, CO4)

Module 5: Exception Handling

Basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, I/O System Basics, File I/O: Exception handling fundamentals, Exception handling options. C++ stream classes, Formatted I/O, fstream and the File classes, Opening and closing a file, Reading and writing text files.

[10 hrs] (CO5)

Course Outcomes:

The student will be able to:

1. Identify classes, objects, members of a class and the relationships among them needed to solve a specific problem;
2. Demonstrate the concept of constructors and destructors. And create new definitions for some of the operators;
3. Create function templates, overload function templates;
4. Understand and demonstrate the concept of data encapsulation, inheritance, polymorphism with virtual functions; &
5. Demonstrate the concept of file operations, streams in C++ and various I/O manipulators.

Suggested Books:

1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.

Reference Books:

1. Stanley B.Lippmann, JoseeLajoie: C++ Primer, 4th Edition, Addison Wesley, 2012.
 2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2011.
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Course Code: BTES301-18	Course Title: Computer Architecture	3L:0T:0P	3Credits
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Detailed Contents:

Module 1: Functional blocks of a computer

CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic. **[10 hrs] (CO1, CO2)**

Module 2: Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

[12 hrs] (CO2, CO4)

Module 3: Pipelining

Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency. **[10 hrs] (CO5)**

Module 4: Memory Organization

Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

[10 hrs] (CO3)

Course Outcomes:

The student will be able to:

- 1: Understand functional block diagram of microprocessor;
- 2: Apply instruction set for Writing assembly language programs;
- 3: Design a memory module and analyze its operation by interfacing with the CPU;
- 4: Classify hardwired and microprogrammed control units; &
- 5: Understand the concept of pipelining and its performance metrics.

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Suggested Books:

1. "Computer Organization and Architecture", Moris Mano,
2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
 2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
 3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
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Course Code: BTIT303-18	Course Title: Data Structure & Algorithms Lab	OL:OT:4P	2Credits
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List of Experiment:

- Task 1:** Write a program to insert a new element at end as well as at a given position in an array.
- Task 2:** Write a program to delete an element from a given whose value is given or whose position is given.
- Task 3:** Write a program to find the location of a given element using Linear Search.
- Task 4:** Write a program to find the location of a given element using Binary Search.
- Task 5:** Write a program to implement push and pop operations on a stack using linear array.
- Task 6:** Write a program to convert an infix expression to a postfix expression using stacks.
- Task 7:** Write a program to evaluate a postfix expression using stacks.
- Task 8:** Write a recursive function for Tower of Hanoi problem.
- Task 9:** Write a program to implement insertion and deletion operations in a queue using linear array.
- Task 10:** Write a menu driven program to perform following insertion operations in a single linked list:

- i. Insertion at beginning
- ii. Insertion at end
- iii. Insertion after a given node
- iv. Traversing a linked list

Task 11: Write a menu driven program to perform following deletion operations in a single linked list:

- i. Deletion at beginning
- ii. Deletion at end
- iii. Deletion after a given node

Task 12: Write a program to implement push and pop operations on a stack using linked list.

Task 13: Write a program to implement push and pop operations on a queue using linked list.

Task 14: Program to sort an array of integers in ascending order using bubble sort.

Task 15: Program to sort an array of integers in ascending order using selection sort.

Task 16: Program to sort an array of integers in ascending order using insertion sort.

Task 17: Program to sort an array of integers in ascending order using quick sort.

Task 18: Program to traverse a Binary search tree in Pre-order, In-order and Post-order.

Task 19: Program to traverse graphs using BFS.

Task 20: Program to traverse graphs using DFS.

Lab Outcomes:

The student will be able to:

1. Improve practical skills in designing and implementing basic linear data structure algorithms;
2. Improve practical skills in designing and implementing Non-linear data structure algorithms;
3. Use Linear and Non-Linear data structures to solve relevant problems;
4. Choose appropriate Data Structure as applied to specific problem definition; &
5. Implement Various searching algorithms and become familiar with their design methods.

Reference Books:

1. "Data Structures with C (Schaum's Outline Series)", Seymour Lipschutz, 1st edition, McGraw Hill Education.

Course Code: BTIT304-18	Course Title: Object Oriented Programming Lab	OL:OT:4P	2Credits
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List of Experiment:

- Task 1:** Write a program that uses a class where the member functions are defined inside a class.
- Task 2:** Write a program that uses a class where the member functions are defined outside a class.
- Task 3:** Write a program to demonstrate the use of static data members.
- Task 4:** Write a program to demonstrate the use of const data members.
- Task 5:** Write a program to demonstrate the use of zero argument and parameterized constructors.
- Task 6:** Write a program to demonstrate the use of dynamic constructor.
- Task 7:** Write a program to demonstrate the use of explicit constructor.
- Task 8:** Write a program to demonstrate the use of initializer list.
- Task 9:** Write a program to demonstrate the overloading of increment and decrement operators.
- Task 10:** Write a program to demonstrate the overloading of memory management operators.
- Task 11:** Write a program to demonstrate the typecasting of basic type to class type.
- Task 12:** Write a program to demonstrate the typecasting of class type to basic type.
- Task 13:** Write a program to demonstrate the typecasting of class type to class type.
- Task 14:** Write a program to demonstrate the multiple inheritances.
- Task 15:** Write a program to demonstrate the runtime polymorphism.
- Task 16:** Write a program to demonstrate the exception handling.
- Task 17:** Write a program to demonstrate the use of class template.
- Task 18:** Write a program to demonstrate the reading and writing of mixed type of data.

Lab Outcomes:

The student will be able to:

1. Develop classes incorporating object-oriented techniques;
2. Design and implement object-oriented concepts of inheritance and polymorphism;
3. Illustrate and implement STL class of containers and need for exceptions to handle errors for object oriented programs; &
4. Design and implement any real world based problem involving GUI interface using object-oriented concepts.

Reference Books:

1. Stanley B.Lippmann, JoseeLajoie: C++ Primer, 4th Edition, Addison Wesley, 2012.
 2. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.
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BTAM304-18

**Mathematics Paper-III (Calculus and
Ordinary Differential Equations)**

3L:0T:0P

3 credits

Detailed Contents:

Module 1:

Limit, continuity for functions with severable variables, partial derivatives, total derivative, Maxima, minima and saddle points; Method of Lagrange multipliers, Multiple Integration: double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications of double and triple integrals to find surface area and volumes.
[CO1, CO2] (12Hrs)

Module 2:

Sequence and series, Bolzano Weirstrass Theorem, Cauchy convergence criterion for sequence, uniform convergence, convergence of positive term series: comparison test, limit comparison test, D'Alembert's ratio test, Raabe's test, Cauchy root test, p-test, Cauchy integral test, logarithmic test, Alternating series, Leibnitz test, Power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions.
[CO3] (13Hrs.)

Module 3:

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

[CO4] (12 hrs.)

Module 4:

Second and higher order linear differential equations with constant coefficients, method of variation of parameters, Equations reducible to linear equations with constant coefficients: Cauchy and Legendre's equations.
[CO5] (12 hrs.)

Course Outcomes: At the end of the course, the student will be able to:

- 1: Understand the functions of several variables that are essential in most branches of engineering;
- 2: Apply multiple integrals to deal with areas and volumes of various structures which are quite significant in real world;
- 3: Formulate and solve engineering problems related to convergence, infinite series, power series and Taylor series;

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4: Create, select and utilize the learnt techniques of first degree ordinary differential equations to model real world problems &;

5: Develop knowledge to solve higher order ordinary differential equations.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. T. Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
6. E.A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

Course Code:BTES301-18	Course Title: Digital Electronics	3L:0T:0P	3Credits
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Detailed Contents:

Module 1:

NUMBER SYSTEMS: Binary, Octal, Decimal, Hexadecimal. Number base conversions, 1's, 2's complements, signed Binary numbers. Binary Arithmetic, Binary codes: Weighted BCD, Gray code, Excess 3 code, ASCII.

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations.

Module 2 :

BOOLEAN ALGEBRA: Boolean postulates and laws – De-Morgan's Theorem, Principle of Duality, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms, Conversion between canonical forms, Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method.

Module 3:

COMBINATIONAL CIRCUITS: Design procedure – Adders, Subtractors, BCD adder, Magnitude Comparator, Multiplexer/Demultiplexer, encoder/decoder, parity checker, code converters. Implementation of combinational logic using MUX, BCD to 7 segment decoder.

SEQUENTIAL CIRCUITS: Flip flops SR, JK, T, D and Master slave, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops. Asynchronous/Ripple counters,

Synchronous counters, Modulo-n counter, Ring Counters. Design of Synchronous counters: state diagram, Circuit implementation. Shift registers.

Module 4:

MEMORY DEVICES: Classification of memories, RAM organization, Write operation, Read operation, Memory cycle. ROM organization, PROM, EPROM, EEPROM, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

A/D & D/A CONVERTORS : Analog & Digital signals. sample and hold circuit, A/D and D/A conversion techniques (Weighted type, R-2R Ladder type, Counter Type, Dual Slope type, Successive Approximation type).

COURSE OUTCOME:At the end of course the student will be able to:

- 1: Demonstrate the operation of simple digital gates, identify the symbols, develop the truth table for those gates; combine simple gates into more complex circuits; change binary, hexadecimal, octal numbers to their decimal equivalent and vice versa.
- 2: Demonstrate the operation of a flip-flop. Design counters and clear the concept of shift registers.
- 3: Study different types of memories and their applications. Convert digital signal into analog and vice versa.

Suggested Readings/ Books:

- Morris Mano, **Digital Design**, Prentice Hall of India Pvt. Ltd
- Donald P. Leach and Albert Paul Malvino, **Digital Principles and Applications**, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
- R.P. Jain, **Modern Digital Electronics**, 3 ed., Tata McGraw-Hill publishing company limited, New Delhi, 2003.
- Thomas L. Floyd, **Digital Fundamentals**, Pearson Education, Inc, New Delhi, 2003
- Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, **Digital System -Principles and Applications**, Pearson Education.
- Ghosal, **Digital Electronics**, Cengage Learning.

Course Code: BTES302-18	Course Title: Digital Electronics Lab	0L:0T:2P	1Credits
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List of Experiments:

1. To verify the Truth-tables of all logic gates.
2. To realize and verify the Half & full adder circuits using logic gates.
3. To realize Half & full subtractor circuits using logic gates.
4. To realize Encoder and Decoder circuits
5. To realize Multiplexer circuits
6. To realize 4-bit binary-gray & gray-binary converters.
7. To realize comparator circuit for two binary numbers of 2-bit each.

8. To realize Full adder & full subtractor circuits using encoder.
9. To design Full adder & full subtractor circuits using multiplexer.
10. To design and verify the Truth tables of all flip-flops.
11. To design Mod-6/Mod-9 synchronous up-down counter.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Realize combinational circuits using logic gates.
2. Realize sequential circuits using logic gates.
3. Realize various types of Flip-flops and counters

Fourth Semester

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Course Code: BTIT401-18	Course Title: Computer Networks	3L:0T:0P	3Credits
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Detailed Contents:

Module 1: Data Communication Components

Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum. **[8 hrs] (CO5)**

Module 2: Data Link Layer and Medium Access Sub Layer

Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA. **[10 hrs] (CO5)**

Module 3: Network Layer

Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols. **[8 hrs] (CO5)**

Module 4: Transport Layer

Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm. **[8 hrs] (CO5)**

Module 5: Application Layer

Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography. **[8 hrs] (CO5)**

Course Outcomes:

The student will be able to:

1. Explain the functions of the different layer of the OSI Protocol;
2. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);
3. Develop the network programming for a given problem related TCP/IP protocol; &
4. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Suggested Books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Reference Books

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
 2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
 3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.
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Course Code: BTIT402-18	Course Title: Operating Systems	3L:0T:0P	3Credits
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Detailed Contents:

Module 1: Introduction

Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

[6 hrs] (CO1)

Module 2: Processes

Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

[10 hrs] (CO2, CO3)

Module 3: Inter-process Communication

Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.
[8 hrs] (CO2)

Module 4: Deadlocks

Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

[8 hrs] (CO3)

Module 5: Memory Management

Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

[10 hrs] (CO4)

Module 6: I/O Hardware

I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free Space Management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

[8 hrs] (CO5, CO6)

Course Outcomes:

The student will be able to:

1. Explain basic operating system concepts such as overall architecture, system calls, user mode and kernel mode;
2. Distinguish concepts related to processes, threads, process scheduling, race conditions and critical sections;
3. Analyze and apply CPU scheduling algorithms, deadlock detection and prevention algorithms;

4. Examine and categorize various memory management techniques like caching, paging, segmentation, virtual memory, and thrashing;
5. Design and implement file management system; &
6. Appraise high-level operating systems concepts such as file systems, disk-scheduling algorithms and various file systems.

Suggested Books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Reference Books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Code: BTIT403-18	Course Title: Design and Analysis of Algorithms	3L:0T:0P	3Credits
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Pre-requisites: Data Structures

Detailed Contents:

Module 1: Introduction

Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem. **[8 hrs] (CO1)**

Module 2: Fundamental Algorithmic Strategies

Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving: Bin Packing, Knap Sack, TSP. **[10 hrs] (CO1, CO2)**

Module 3: Graph and Tree Algorithms

Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm. **[10 hrs] (CO3)**

Module 4: Tractable and Intractable Problems

Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques. **[8 hrs] (CO5)**

Module 5: Advanced Topics

Approximation algorithms, Randomized algorithms, Heuristics and their characteristics.

[6 hrs] (CO1, CO4, CO5)

Course Outcomes:

The student will be able to:

1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms;
2. Explain when an algorithmic design situation calls for which design paradigm (greedy/divide and conquer/backtrack etc.);
3. Explain model for a given engineering problem, using tree or graph, and write the corresponding algorithm to solve the problems;
4. Demonstrate the ways to analyze approximation/randomized algorithms (expected running time, probability of error); &
5. Examine the necessity for NP class based problems and explain the use of heuristic techniques.

Suggested Books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Data Structures and Algorithms in C++, Weiss, 4th edition, Pearson.
3. Fundamentals of Computer Algorithms – E. Horowitz, Sartaj Saini, Galgota Publications.

Reference Books

1. Algorithm Design, 1st Edition, Jon Kleinberg and Éva Tardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, Udi Manber, Addison-Wesley, Reading, MA.

Course Code: BTIT405-18	Course Title: Operating Systems Lab	OL:OT:4P	2Credits
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List of Experiment:

- Task 1:** Installation Process of various operating systems.
- Task 2:** Implementation of CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority.

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- Task 3:** Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine.
- Task 4:** Commands for files & directories: cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in linux, connecting processes with pipes, background processing, managing multiple processes. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file. File related commands ws, sat, cut, grep.
- Task 5:** Shell Programming: Basic of shell programming, various types of shell, Shell Programming in bash, conditional & looping statement, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.
- Task 6:** Implementation of Bankers algorithm for the purpose of deadlock avoidance.

Lab Outcomes:

The student will be able to:

1. Understand and implement basic services and functionalities of the operating system;
2. Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority;
3. Implement commands for files and directories;
4. Understand and implement the concepts of shell programming;
5. Simulate file allocation and organization techniques; &
6. Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.

Reference Books:

1. Operating Systems: Design and Implementation, Albert S. Woodhull and Andrew S. Tanenbaum, Pearson Education.

Course Code: BTIT406-18	Course Title: Design and Analysis of Algorithms Lab	OL:OT:4P	2Credits
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List of Experiment:

- Task 1:** Code and analyze solutions to following problem with given strategies:
- i. Knap Sack using greedy approach
 - ii. Knap Sack using dynamic approach

- Task 2:** Code and analyze to find an optimal solution to matrix chain multiplication using dynamic programming.
- Task 3:** Code and analyze to find an optimal solution to TSP using dynamic programming.
- Task 4:** Implementing an application of DFS such as:
- i. to find the topological sort of a directed acyclic graph
 - ii. to find a path from source to goal in a maze.
- Task 5:** Implement an application of BFS such as:
- i. to find connected components of an undirected graph
 - ii. to check whether a given graph is bipartite.
- Task 6:** Code and analyze to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.
- Task 7:** Code and analyze to find shortest paths in a graph with arbitrary edge weights using Bellman-Ford algorithm.
- Task 8:** Code and analyze to find shortest paths in a graph with arbitrary edge weights using Flyods' algorithm.
- Task 9:** Code and analyze to find the minimum spanning tree in a weighted, undirected graph using Prims' algorithm
- Task 10:** Code and analyze to find the minimum spanning tree in a weighted, undirected graph using Kruskals' algorithm.
- Task 11:** Coding any real world problem or TSP algorithm using any heuristic technique.

Lab Outcomes:

The student will be able to:

1. Improve practical skills in designing and implementing complex problems with different techniques;
2. Understand comparative performance of strategies and hence choose appropriate, to apply to specific problem definition;
3. Implement Various tree and graph based algorithms and become familiar with their design methods; &
4. Design and Implement heuristics for real world problems.

Reference Books

1. Data Structures and Algorithms in C++, Weiss, 4th edition, Pearson
2. Data Structures and Algorithms using Python and C++, David M. Reed and John Zelle, 2009 edition (available as e book), Franklin Beedle& Associates.

Course Code: BTIT404-18	Course Title: Computer Networks Lab.	OL:OT:2P	1Credits
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List of Experiments:

- Task1 : To study the different types of Network cables and network topologies
- Task2 :Practically implement and test the cross-wired cable and straight through cable using clamping tool and network lab cable tester.
- Task3 :Study and familiarization with various network devices.
- Task4 :Familiarization with Packet Tracer Simulation tool/any other related tool.
- Task5 :Study and Implementation of IP Addressing Schemes
- Task6 :Creation of Simple Networking topologies using hubs and switches
- Task7 :Simulation of web traffic in Packet Tracer
- Task8 :Study and implementation of various router configuration commands
- Task9 :Creation of Networks using routers.
- Task10 :Configuring networks using the concept of subnetting
- Task11 :Practical implementation of basic network command and Network configuration commands like ping, ipconfig, netstat , tracertr etc. for trouble shooting network related problems.
- Task12 :Configuration of networks using static and default routes.

Course Outcomes:

The students will be able to

- 1: Know about the various networking devices, tools and also understand the implementation of network topologies;
- 2:Create various networking cables and know how to test these cables;
- 3:Create and configure networks in packet tracer tool using various network devices and topologies;
- 4:Understand IP addressing and configure networks using the subnetting;
- 5:Configure routers using various router configuration commands;&
- 6:Troubleshoot the networks by using various networking commands.

Course Code: EVS101-18	Course Title: Environmental Studies-	L:2; T:0; P:0	0Credits
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.Detailed Contents

Module 1 : Natural Resources :Renewable and non-renewable resources

Natural resources and associated problems.

- a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.
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Module 2 : Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem.

Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems:

- a. Forest ecosystem
- b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
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Module 4 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Resettlement and rehabilitation of people; its problems and concerns.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, Nuclear accidents

and holocaust. Case Studies.

- Public awareness.

***ACTIVITIES**

Nature club (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity)

Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc.

Following activities must be included.

Identify a tree fruit flower peculiar to a place or having origin from the place.

Making high resolution big photographs of small creatures (bees, spiders, ants, mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants).

Videography/ photography/ information collections on specialties/unique features of different types of common creatures.

Search and explore patents and rights related to animals, trees etc. Studying miracles of mechanisms of different body systems.

1(A) Awareness Activities:

- a) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- b) Slogan making event
- c) Poster making event
- d) Cycle rally
- e) Lectures from experts
- f)** Plantation
- g) Gifting a tree to see its full growth
- h) Cleanliness drive
- i)** Drive for segregation of waste
- i) To live with some eminent environmentalist for a week or so to understand his work
- vi) To work in kitchen garden for mess
- j) To know about the different varieties of plants
- k) Shutting down the fans and ACs of the campus for an hour or so
- l) Visit to a local area to document environmental assets
river/forest/grassland/hill/mountain/lake/Estuary/Wetlands
- m) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- n) Visit to a Wildlife sanctuary, National Park or Biosphere Reserve

Suggested Readings

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1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
9. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
12. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (R)
13. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
14. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

Course Code: HSMC101-18	Course Title: Development of Societies	3L:0T:0P	3Credits
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Detailed Contents:

Unit I: Social Development (5 hours)

1. Concepts behind the origin of Family, Clan and Society
2. Different Social Systems
3. Relation between Human being and Society
4. Comparative studies on different models of Social Structures and their evolution

Unit II: Political Development (3 hours)

1. Ideas of Political Systems as learnt from History
2. Different models of Governing system and their comparative study

Unit III: Economic Development (18 hours)

1. Birth of Capitalism, Socialism, Marxism

2. Concept of development in pre-British, British and post British period- Barter, Jajmani
3. Idea of development in current context.
4. E. F. Schumacher's idea of development, Buddhist economics.

Gandhian idea of development. Swaraj and Decentralization.

PROJECT: Possible projects in this course could be

- a) Interact with local communities and understand their issues.
- b) Study local cottage industry and agricultural practices. Role of engineering and specialized knowledge.
- c) Evaluation of technology in the context of its application. Social impact of technology. Environmental impact of technology. Evaluation from a holistic perspective.

Course Code: HSMC102-18	Course Title: PHILOSOPHY	3L:0T:0P	3Credits
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Detailed Contents:

Unit 1:

The difference between knowledge (Vidya) and Ignorance (Avidya):

- a. Upanishads;
- b. Six systems orthodox and Heterodox Schools of Indian Philosophy.
- c. Greek Philosophy:

Unit 2:

Origin of the Universe:

- NasidiyaSukta: "Who really knows?"
- Brhadaranyaka Upanishad; Chandogya Upanishad: Non-self, Self, real and unreal.
- Taittiriya Upanishad: SikshaValli.
- Plato's Symposium: Lack as the source of desire and knowledge.
- Socratic's method of knowledge as discovery.
- Language: Word as root of knowledge (Bhartrahari'sVakyapadiyam)
- Fourteen Knowledge basis as a sources of Vidya: Four Vedas; Six auxiliary sciences (Vedangas); Purana, Nyaya, Mimamsa and Dharma Sastras.

Unit 3:

Knowledge as Power: Francis Bacon. Knowledge as both power and self-realization in Bagavad Gita.

Unit 4:

Knowledge as oppression: M. Foucault. Discrimination between Ram and Satyam in Indian Philosophy.

Unit 5:

Knowledge as invention: Modern definition of creativity; scientific activity in the claim that science invents new things at least through technology.

Unit 6:

Knowledge about the self, transcendental self; knowledge about society, polity and nature.

Unit 7:

Knowledge about moral and ethics codes.

Unit 8:

Tools of acquiring knowledge: Tantrayuktis, a system of inquiry (Caraka, Sushruta, Kautilya, Vyasa)

READINGS

1. Copleston, Frederick, History of Philosophy, Vol. 1. Great Britain: Continuum.
2. Hiriyanna, M. Outlines of Indian Philosophy, Motilal Banarsidass Publishers; Fifth Reprint edition (2009)
3. Sathaye, Avinash, Translation of Nasadiya Sukta
4. Ralph T. H. Griffith. The Hymns of the R̥gveda. Motilal Banarsidass: Delhi: 1973.
5. Raju, P. T. Structural Depths of Indian Thought, Albany: State University of New York Press.
6. Plato, Symposium, Hamilton Press.
7. Kautilya Artha Sastra. Penguin Books, New Delhi.
8. Bacon, Nova Organum
9. Arnold, Edwin. The Song Celestial.
10. Foucault, Knowledge/Power.
11. Wildon, Anthony, System of Structure.
12. Lele, W.K. The Doctrine of Tantrayukti. Varanasi: Chowkamba Series.
13. Dasgupta, S. N. History of Indian Philosophy, Motilal Banarsidas, Delhi.
14. Passmore, John, Hundred Years of Philosophy, Penguin.

ASSESSMENT (indicative only):

Ask students to do term papers, for example, writing biographical details of founders, sustainers, transmitters, modifiers, rewriters; translating monographs of less known philosophers such as K. C. Bhattacharys, Daya Krishna, Gopinath Bhattacharya; comparative study of philosophical system such as MadhyasthaDarshan.

OUTCOME OF THE COURSE:

Students will develop strong natural familiarity with humanities along with right understanding enabling them to eliminate conflict and strife in the individual and society. Students shall be able to relate philosophy to literature, culture, society and lived experience can be considered.

BTCS401-18	Discrete Mathematics	3L:1T:0P	4 Credits
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Detailed contents:

Module 1:

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. CO1, CO2

Module 2:

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination. CO3

Module 3:

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency. CO3, CO4

Module 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form CO4

Module 5:

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances. CO5

Suggested books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Suggested reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science”, TMG Edition, TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum’s Outlines Series, Seymour Lipschutz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw - Hill

Course Outcomes

1. To be able to express logical sentence in terms of predicates, quantifiers, and logical connectives
 2. To derive the solution for a given problem using deductive logic and prove the solution based on logical inference
 3. For a given a mathematical problem, classify its algebraic structure
 4. To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
 5. To develop the given problem as graph networks and solve with techniques of graph theory.
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