Scheme & Syllabus of

Bachelor of Technology

Information Technology

Batch 2018 onwards

(3rd-8thSem.)-Affiliated Colleges

Department of Academics

IK Gujral Punjab Technical University,Kapurthala

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.

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 CoreCourses	Operating Systems Lab	0	0	4	30	20	50	2
BTIT 406-18	Professional CoreCourses	Design & Analysis of Algorithms Lab	0	0	4	30	20	50	2
Total			**14**	**2**	**10**	**290**	**360**	**650**	**21**

Students will take up summer internship of 4-6 weeks at industry or organizations of repute after 4th sem, that will be accredited in 5th semester.

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 502-18	Professional Core Courses	Database Management Systems	3	0	0	40	60	100	3
BTIT 503-18	Professional Core Courses	Programming in Java	3	0	0	40	60	100	3
BTIT 504-18	Professional Core Courses	Software Engineering	3	0	0	40	60	100	3
HSMC122-18	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 505-18	Professional Core Courses	Database Management Systems Lab	0	0	4	30	20	50	2
BTIT 506-18	Professional Core Courses	Programming in Java Lab	0	0	2	30	20	50	1
BTIT 507-18	Professional Core Courses	Programming in Software Engg.	0	0	2	30	20	50	1
BTIT XXX-18	Professional Elective	Elective-I lab	0	0	2	30	20	50	1
	Professional Training	Industrial *Training	-	-	-	60	40	100	S/US
Total			20	**0**	10	**360**	**440**	**800**	**23**

* 4-6 weeks industrial training undertaken after 4th semester in summer vacations.

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**

Seventh/ Eighth 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
BTOE ***	Open Elective Courses	Open Elective-III	3	0	0	40	60	100	3
Total			**15**	**0**	**12**	**380**	**370**	**750**	**21**

Seventh/ Eighth Semester

Course Code	**Course Title**	**Marks Distribution**		**Total Marks**	**Credits**
		Internal	**External**		
BTCS 801-18	Semester Training	300	200	500	16

LIST OF ELECTIVES

Elective-I

BTIT 508-18 E-Commerce
BTIT 509-18 Cyber Laws and IPR
BTIT 510-18 Computational Biology
BTIT 511-18 Artificial Intelligence
BTIT 512-18 E-Commerce Lab
BTIT 513-18 Cyber laws and IPR lab
BTIT 514-18 Computational Biology lab
BTIT 515-18 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 DataWare and Minning
BTIT 707-18 Ad-Hoc and Sensor Networks
BTIT 708-18 Speech and Natural Language Processing
BTIT 709-18 Network Programming

BTIT 714-18 DataWAre Minning 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

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

LIST OF COURSES FOR HONOURS DEGREE

In order to have an Honours degree, a student choose 18-20 credits from the following course 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

BTIT H09-18	Professional Elective Courses	Advanced Algorithms	3	0	0	40	60	100	3

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		
BTIT301-18 & BTIT303-18	PCC	Data structure and Algorithms Theory & Lab	3	0	4	40T+30P	60T+20P	150	5
BTIT302-18 & BTIT304-18	PCC	Object Oriented Programming Theory & Lab	3	0	4	40T+30P	60T+20P	150	5
BTIT401-18 & BTCS404-18	PCC	Computer networks Theory & Lab	3	0	2	40T+30P	60T+20P	150	4
BTIT402-18 & BTIT405-18	PCC	Operating system Theory & Lab	3	0	4	40T+30P	60T+20P	150	5
BTES302-18	ESC	Computer Organisation	3	0	0	40	60	150	3
BTIT501-18 & BTIT504-18	PCC	Database Management system Theory & Lab	3	0	4	40T+30P	60T+20P	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.

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		
BTIT509-18 & BTIT513-18	ELECTIVE	Artificial Intelligence Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BIT608-18 & BTIT616-18	ELECTIVE	Machine Learning Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT613-18 & BTIT621-18	ELECTIVE	Cloud computing Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT506-18 & BTIT510-18	ELECTIVE	Ecommerce Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT804-18 & BTIT808-18	ELECTIVE	Data Analysis Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT611-18 & BTIT619-18	ELECTIVE	Management Information System Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT706-18 & BTIT714-18	ELECTIVE	Data Mining Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT802-18 & BTIT806-18	ELECTIVE	Internet of Things Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
BTIT704-18 & BTIT712-18	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**

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 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 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**

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/0: 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.

Course Code: BTES301-18	Course Title: Computer Architecture	3L:0T:0P	3Credits

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-andadd, 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 Writingassembly 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.

Suggested Books:

1. "ComputerOrganization and Architecture", Moris Mano,
2. "ComputerOrganization 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 CarlHamacher, 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.

Course Code: BTIT303-18	**Course Title:** Data Structure & AlgorithmsLab	**0L:0T:4P**	**2Credits**

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	**0L:0T:4P**	**2Credits**

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.

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 mostbranches 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 solveengineering problems related to convergence, infinite series, power series and Taylor series;

4: Create, select and utilize the learnt techniques of first degree ordinary differential equationsto 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

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 an 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 HillPublishing CompanyLimited, 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**, PearsonEducation.
- Ghosal ,**Digital Electronics**, Cengage Learning.

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

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

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

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.

Course Code: BTIT402-18	**Course Title:** Operating Systems	**3L:0T:0P**	**3Credits**

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, StrictAlternation, Peterson's Solution, TheProducer\ConsumerProblem, Semaphores,EventCounters,Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning 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: MemoryManagement

Basicconcept,LogicalandPhysical address map, Memory allocation: Contiguous Memory allocation –Fixedandvariable partition–Internaland Externalfragmentation andCompaction;Paging:Principleof operation – Page allocation– Hardwaresupportforpaging,Protectionandsharing, 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, Allocationmethods (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

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Course Code: BTIT403-18	**Course Title:** Design and Analysis of Algorithms	**3L:0T:0P**	**3Credits**

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 writethe 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, 1stEdition, Jon Kleinberg and ÉvaTardos, 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, UdiManber, Addison-Wesley, Reading, MA.

Course Code: BTIT405-18	**Course Title:** Operating Systems Lab	**0L:0T:4P**	**2Credits**

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.

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	**0L:0T:4P**	**2Credits**

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.	**0L:0T:2P**	**1Credits**

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 , tracert 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 subnettin;

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

.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 resoureces 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.
- Inida as a mega-diversity nation
- Hot-sports 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 rahabilitation 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

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, 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

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

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 Rtam 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, MotilalBanarsidass Publishers; Fifth Reprint edition (2009)

3 Sathaye, Avinash, Translation of NasadiyaSukta

4. Ralph T. H. Griffith. The Hymns of the Ṛgveda. MotilalBanarsidass: Delhi: 1973.

5. Raju, P. T. Structural Depths of Indian Thought, Albany: State University of New York Press.

6. Plato, Symposium, Hamilton Press.

7. KautilyaArtha Sastra. Penguin Books, New Delhi.

8. Bacon, Nova Orgum

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, MotilalBanasidas, 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**

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.

Fifth Semester

Course Code: BTIT501-18	**Course Title:** Formal Language & Automata Theory	**3L:1T:0P**	**3Credits**	**42 Hours**

Detailed Contents

Module 1: Introduction

Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

[3hrs] (CO1)

Module 2: Regular languages and finite automata:

Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular, languages, minimization of finite automata.

[8hrs] (CO2)

Module 3: Context-free languages and pushdown automata

Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

[8hrs] (CO3,)

Module 4: Context-sensitive languages

Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

[5hrs] (CO 4)

Module 5: Turing machines

The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

[8hrs] (CO 4)

Module 6: Undecidability & Intractablity:

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Intractablity: Notion of tractability/feasibility. The classes NP and co-NP, their importance. Polynomial time many-one reduction. Completeness under this reduction. Cook-Levin theorem: NP-completeness of propositional satisfiability, other variants of satisfiability. NP-complete problems from other domains: graphs (clique, vertex cover, independent sets, Hamiltonian cycle), number problem (partition), set cover

[12hrs] (CO5)

Course Outcomes: The student will be able to:

CO1: Understand a formal notation for strings, languages and machines.

CO2: Design finite automata to accept a set of strings of a language.

CO3: Design context free grammars to generate strings of context free language .

CO4: Write the hierarchy of formal languages, grammars and machines.

CO5: Distinguish between computability and non-computability and Decidability and undecidability.

Text Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Reference Books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Code: BTIT502-18	**Course Title:** Database Management Systems	**3L:0T:0P**	**3Credits**	**42 Hours**

Detailed Contents:

Module 1: Database system architecture

Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented Data models, integrity constraints, data manipulation operations.

[7hrs] (CO1,2)

Module 2: Relational query languages

Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

[10hrs] (CO2,4)

Module 3:

Storage strategies, Indices, B-trees, hashing. **[3hrs] (CO3)**

Module 4: Transaction processing

Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

[6hrs] (CO 3)

Module 5: Database Security

Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

[8hrs] (CO 4,5)

Module 6: Advanced Topics

Object oriented and object relational databases, Logical databases, Web databases, Distributed databases .

[8hrs] (CO 5)

Course Outcomes: The student will be able to:
CO1: write relational algebra expressions for that query and optimize the Developed expressions
CO2: design the databases using ER method and normalization.
CO3: construct the SQL queries for Open source and Commercial DBMS-MYSQL, ORACLE, and DB2.
CO4:determine the transaction atomicity, consistency, isolation, and durability.
CO5: Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

Text Books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Reference Books:

1. "Principles of Database and Knowledge–Base Systems", Vol1 by J. D. Ullman, Computer Science Press.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
3. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

Course Code: BTIT503-18	**Course Title: Programming in Java**	**3L:0T:0P**	**3Credits**	**42 Hours**

Detailed Contents:

UNIT1:

Overview: Object oriented programming principles, Java essentials, java virtual machine, program structure in java ,Java class libraries, Data types, Variables and Arrays, Data types and casting, automatic type promotion in expressions, arrays.

Operators and Control Statements: Arithmetic operators, bit wise operators, relational operators, Boolean logical operators, the ? Operator, operator precedence, Java's selection statements, iteration statements, jump statements. [12 hrs., CO1]

UNIT 2:

Introduction to Classes: Class fundamentals, declaring class, creating objects, Introducing methods: method declaration, overloading, using objects as parameters, recursion, Constructors, this keyword, garbage collection, the finalization. [9hrs., CO1]

UNIT 3:

Inheritance: Inheritance basics, using super and final, method overriding, dynamic method dispatch, Abstract Class, Interface: variables and extending Interfaces, Package: Creating and importing packages, Package access protection, Exception Handling: Exception handling fundamentals, Exception types, Uncaught Exceptions Using try and catch, multiple catch clauses, nested try statements, throw, Java's built-in exceptions. [12hrs.,CO1,2]

UNIT 4:

Multithreaded Programming: The Java thread model, the main thread, creating thread, creating multiple threads, using isAlive () and join (), Thread priorities, synchronization, Inter thread communications, suspending resuming and stopping threads. [4hrs., CO3]

UNIT5:

I/O : I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files , Applets: Applet Fundamentals, Applet Architecture, The HTML Applet tag, Passing parameters to Applets., Networking: Networking basics, Java and the Net, TCP/IP Client Sockets URL, URL Connection, TCP/IP Server Sockets, Database connectivity. [6hrs., CO4]

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

CO1. Understand the features of Java such as opeartors, classes, objects, inheritance, packages and exception handling

CO2. Learn latest features of Java like garbage collection,Console class, Network interface, APIs

CO3.Acquire competence in Java through the use of multithreading, applets

CO4. Get exposure to advance concepts like socket and databease connectivity.

Suggested Readings/Books :

1.Herbert Schildt, The Complete Reference Java2, McGraw-Hill.
2.Joyce Farrell, Java for Beginners, Cengage Learning.
3.Deitel and Deitel, Java: How to Program, 6th Edition, Pearson Education.
4.James Edward Keogh, Jim Keogh, J2EE: The complete Reference, McGrawHill
5.Khalid A. Mughal, Torill Hamre, Rolf W. Rasmussen, Java Actually, Cengage Learning.

6. Shirish Chavan, Java for Beginners, 2nd Edition, Shroff Publishers.

Course Code: BTIT504-18	Course Title: Software Engineering	3L:1T:0P	3Credits	42 Hours

Detailed Contents:

Module 1:
Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

[10hrs] **(CO1,2)**

Module 2:
Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, user interface design. Coding standards and Code review techniques.

[8hrs] **(CO3)**

Module 3:
Fundamentals of testing, White-box, and black-box testing, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics, reliability growth modeling. **[10hrs]** **(CO4)**

Module 4:
Software project management, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts, cost-time relations: Rayleigh-Norden results, quality management **[8hrs]** **(CO 4,5)**

Module 5:
ISO and SEI CMMI, PSP and Six Sigma. Computer aided software engineering, software maintenance, software reuse, Component-based software development. **[6hrs]** **(CO5)**

Text Books:

1. Roger Pressman, "Software Engineering: A Practitioners Approach,(6th Edition), McGraw Hill, 1997.

Reference Books:

1. Sommerville, "Software Engineering, 7th edition", Adison Wesley, 1996.
2. Watts Humphrey, "Managing software process", Pearson education, 2003.
3. James F. Peters and Witold Pedrycz, " Software Engineering – An Engineering Approach", Wiley.
4. Mouratidis and Giorgini. "Integrating Security and Software Engineering–Advances and Future", IGP. ISBN – 1-59904-148-0.
5. Pankaj Jalote, "An integrated approach to Software Engineering", Springer/Narosa.
6. Fundamentals of Software Engineering by Rajib Mall, – PHI-3rd Edition, 2009.

Course Outcomes:

1	Understanding of Software process models such as the waterfall, prototyping and spiral models
2	Understanding of the role of project management including planning, scheduling, risk management, etc.
3	Understanding of object models, data models, context models and behavioral models.
4	Describe implementation issues such as modularity and coding standards.
5	Understanding of software testing approaches such as unit testing, integration testing and system testing

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Course Code: BTIT505-18	**CourseTitle:** Database management System lab	**0L:0T:4P**	**2Credits**	**4 Hours/ week**

List of Experiments:

Task 1: Introduction to SQL and installation of SQL Server / Oracle.

Task 2: Data Types, Creating Tables, Retrieval of Rows using Select Statement, Conditional Retrieval of Rows, Alter and Drop Statements.

Task 3: Working with Null Values, Matching a Pattern from a Table, Ordering the Result of a Query, Aggregate Functions, Grouping the Result of a Query, Update and Delete Statements.

Task 4: Set Operators, Nested Queries, Joins, Sequences.

Task 5: Views, Indexes, Database Security and Privileges: Grant and Revoke Commands, Commit and Rollback Commands.

Task 6: PL/SQL Architecture, Assignments and Expressions, Writing PL/SQL Code, Referencing Non-SQL parameters.

Task 7: Stored Procedures and Exception Handling.

Task 8: Triggers and Cursor Management in PL/SQL.

Suggested Tools – MySQL, DB2, Oracle, SQL Server 2012, Postgre SQL, SQL lite

Course Outcomes:

CO1: This practical will enable students to retrieve data from relational databases using SQL.

CO2: students will be able to implement generation of tables using datatypes

CO3: Students will be able to design and execute the various data manipulation queries.

CO4: Students will also learn to execute triggers, cursors, stored procedures etc.

Course Code: BTIT506-18	**CourseTitle: Prog. In Java** lab	**0L:0T:2P**	**1Credits**	**2 Hours/ week**

To accomplish CO1;

1. WAP in Java to show implementation of classes.

2. WAP in Java to show implementation of inheritance.

3. WAP in Java to show Implementation of packages and interfaces.

To accomplish CO2;

4. WAP in Java to show Implementation of threads.

5. WAP in Java Using exception handling mechanisms.

6. WAP in Java to show Implementation of Applets.

To accomplish CO3;

7. WAP in Java to show Implementation of mouse events, and keyboard events.

8. WAP in Java to show Implementing basic file reading and writing methods.

9. Using basic networking features,WAP in Java

To accomplish CO4;

10. WAP in Java to show Connecting to Database using JDBC.

Project work: A desktop based application project should be designed and implemented in java.

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

CO1. Implement the features of Java such as opeartors, classes, objects, inheritance, packages and exception handling

CO2. Design problems using latest features of Java like garbage collection,Console class, Network interface, APIs

CO3. Develop competence in Java through the use of multithreading, Applets etc

CO4. Apply advance concepts like socket and database connectivity, and develop project based on industry orientation.

Suggested Readings/Books

1. Herbert Schildt, The Complete Reference Java2, McGraw-Hill.

2. Deitel and Deitel, Java: How to Program, 6th Edition, Pearson Education.

3. James Edward Keogh, Jim Keogh, J2EE: The complete Reference, McGrawHill

Course Code: BTIT507-18	**Course Title:** Software Engineering Lab	**0L:0T:2P**	**1 Credits**

List of Experiments:

Task 1: Study and usage of OpenProj or similar software to draft a project plan
Task 2: Study and usage of OpenProj or similar software to track the progress of a project
Task 3: Preparation of Software Requirement Specification Document, Design Documents and Testing Phase
Task 4: related documents for some problems
Task 5: Preparation of Software Configuration Management and Risk Management related documents
Task 6: Study and usage of any Design phase CASE tool
Task 7: To perform unit testing and integration testing
Task 8: To perform various white box and black box testing techniques
Task 9: Testing of a web site

Suggested Tools **-** Visual Paradigm, Rational Software Architect. Visio, Argo UML, Rational Application Developer etc. platforms.

Course Outcomes:

SNO	DESCRIPTION
CO1	Select a software engineering process life cycle model.
CO2	Define the requirements of the software.
CO3	Analyze the given specification into a design
CO4	Contrast the various testing and quality assurance techniques.
CO5	Apply modern engineering tools for specification, design, implementation, and testing

ELECTIVE I

Course Code: BTIT509-18	**Course Title:** Cyber laws and IPR	**3L:0T:0P**	**3Credits**

Detailed Contents

UNIT 1:Digital Crimes

From Mainframes to Metaverse: The Origins and Evolution of Cybercrime, Three Categories of Cybercrime, Target Cybercrimes: Hacking, Malware, and Distributed Denial of Service Attacks, Tool Cybercrimes: Fraud, Harassment . . .Murder?, Cyber-CSI: Computer Crime Scene [8 hrs., CO1]

UNIT 2: Digital Law and Cyber Crimes

Who Are the Cybercriminals?, Cyber-Law and Order: Investigating and Prosecuting Cybercrime, Indian Law Enforcement: Agencies and Challenges, Global Law Enforcement: Few Agencies, Even More Challenges, Privacy versus Security: Which Trumps?, New Ways to Fight Cybercrime [6 hrs., CO2]

UNIT3: IT ACT 2000

Aims and Objectives; Overview of the Act; Jurisdiction; Role of Certifying Authority;

Regulators under IT Act; Cyber Crimes-Offences and Contraventions; Grey Areas of IT Act. [4hrs., CO2]

UNIT 4:Understanding of Intellectual Property (IP) and Intellectual Property Rights (IPRs)

Introduction of IPR, An Overview of the IPR Regime, Philosophical Justification: Lockean Justification: Labour Theory, Hegelian Justification: Personality Theory, Utilitarian Theory [3 hrs., CO3]

UNIT 5: Subject Matter of Copyright

Literary works, Derivative Works, Computer Software/ Programs; Ownership of Copyright and Right of Copyright Owner: Author and Joint Author, Presumption of Authorship, Owner of different categories of Copyright, Right of Reproduction, Right of Derivative Works, Right of Broadcasting, Right of Communication of Works to the Public, Right of Paternity, Right to Publish [8hrs., CO3]

UNIT 6: Infringement of Copyright and Permitted Use of Copyright

Meaning of Infringement, Direct Infringement, Indirect (Contributory) Infringement

Reasons for Taking Actions against Infringement, Fair use doctrine [6 hrs., CO4]

Suggested Readings/Books:

1. Nandan Kamath, A Guide to Cyber Laws & IT Act 2000 with Rules & Notification

2. Talat Fatima, Cybercrims, Eastern Book Company

4. Susan W. Brenner, Cybercrime Criminal Threats from Cyberspace, Praegar Publications

3. Vakul Sharma (Mc Millian), Handbook of Cyber Laws

4. B. L. Wadehra, Law Relating to Patents, Trade Marks, Copyright, Design and Geographical Indications, Universal Law Publishing Company, Limited, New Delhi

5. N.S. Gopalakrishnan & T.G. Agitha, "Principles of Intellectual Property", (2nd Edition, 2014).

6. V. K. Ahuja, "Law Relating to Intellectual Property" (3rd Edition 2017)

7. P Narayana, Copyright and Industrial Designs, Third Edition, Eastern Law House, Private Limited, Kolkata

Course Outcomes: At the end the students shall be able to:

CO1. Explain the various digital crimes and comprehend the basic features of these crimes.

CO2. Analyze how laws are enforced in the digital and cyber environment and the challenges that are forced in their enforcement.

CO3. Understand to identify what is a Protectable Subject matter under Copyright Laws and what is the manner of obtaining Copyright protection.

CO4. Gain expert knowledge in application of various provisions of Copyright law to determine the rights to which the IP holder will be entitled.

Course Code: BTIT508-18	**Course Title: E-Commerce**	**3L:0T:0P**	**3Credits**

Detailed Contents:

UNIT I: INTRODUCTION

Introduction to E- Commerce,Generic Framework of E- Commerce, Business Models, Consumer Oriented E- Commerce Applications, Mercantile Process Models

[5hrs, CO1]

UNIT II: NETWORK INFRASTRUCTURE AND MOBILE COMMERCE;

Network Infrastructure for E-Commerce, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication (ATM, ISDN, Frame Relay), Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology [9hrs., CO2]

UNIT III: WEB SECURITY :

Security Issues on Web- World Wide Web & Security, Importance of Firewall- Components of Firewall, Factors to consider in Firewall Design, Limitations of Firewalls, Transaction Security-Client Server Network , Emerging Client Server Security Threats-Network Security.

[10hrs., CO3]

UNIT IV: SECURITY :

Encryption Techniques, Symmetric Encryption- Keys and Data Encryption standard, Triple encryption, Asymmetric encryption- Secret Key Encryption, Public and Private pair key encryption, Digital Signatures-Virtual Private Network (VPN)

[8hrs., CO3]

UNIT V: ELECTRONIC PAYMENTS :

Overview of Electronics payments, The SET Protocol, Payment Gateway, Certificates

Digital Token, Smart Cards, Credit Cards, Magnetic Strip Cards, E-Checks, Credit/ Debit card EPS, Mobile Payments, Online Banking, Home banking, Emerging financial Instruments, EDI Application in Business, E-commerce laws, Forms of Agreement, Government Policies and Agenda, E-Commerce Strategy in Business Models and Internet.

[10hrs., CO4]

TEXT BOOKS

1. Ravi Kalakota and Andrew B Whinston, “Frontiers of Electronic Commerce”, Pearson Education,2013.

2. Greenstein and Feinman, “E-Commerce”, TMH,2001

REFERENCE BOOKS/OTHER READING MATERIAL

3. Denieal Amor, “The E-Business Revolution”, Addison Wesley, Second edition 2002.

4. Bajaj & Nag, “E-Commerce: The Cutting Edge of Business”, TMH,Second Edition 2005

5. DiwanParag / Sharma Sunil , “E-commerce :A Manager's Guide to E-Business”First edition 2000

Course outcomes: At the students shall be able to:

CO1.Distinguish the E-Commerce framework and business model applications

CO2. Outline the Infrastructure of E-commerce

CO3. Apply security algorithms

CO4. Identify and operate e-payment mechanisms.

Course Code: BTIT510-18	**CourseTitle:**Computational Biology	**3L:0T:0P**	**3Credits**

Detailed Contents:

Module 1: Introduction

Nature and scope of life science: Branches of life sciences, Characteristics of life, Levels of Organization, Origin of life, Biochemical evolution- evolution of Proteins and Nucleotide. Cell Biology: The cell as basic unit of life- Prokaryotic cell and Eukaryotic cell, Cell Structure and Function- cell membrane, cell organelles, Cell Division; Mitosis & Meiosis. Cell Energetics: Laws of Thermodynamics, Photosynthesis, Anaerobic & aerobic respiration, Structure and function of mitochondria, respiratory pathways: Glycolysis, Kreb's Cycle, Electron transport chain.

[10hrs] (CO1)

Module 2: More about RNA and DNA

Chromosome-Genome-Genes-Databases: Bio-molecules- DNA, RNA, Protein and amino acids, Chargaff's Rules, GC content.

Central Dogma: Replication, Transcription, Translation, Post transcriptional & post translational modifications, RNA processing, RNA splicing and RNA editing. Sense/coding and anti-sense/template strands, Genetic code. Introduction to DNA and Protein sequencing.

[10hrs] (CO2)

Module 3: Proteins

Proteins and Databases: Protein structure and function, Protein Primary structure, Amino acid residues, Secondary, Tertiary, Quaternary Structure of Protein, Protein sequence databases- SwissProt/ TrEMBL, PIR, Sequence motif databases -Pfam, PROSITE, Protein structure databases. [8hrs] (CO3)

Module 4: Computation and Biology

Molecular computational biology: Gene prediction, sequencing genomes, similarity search, restriction mapping,. Sequence Analysis: Principles and its uses, Hidden Markov models for sequence analysis. Introduction of Markov Chain and Hidden Markov models. Forward backward algorithm, Viterbi and Baum-Welch algorithms. [14hrs] (CO4)

Course Outcomes: The student will be able to:

CO1: Understand the basic of cell structure, divisions involved in reproduction of a cell, and its generic functionality;

CO2: Recognize the base line elements of a RNA and DNA; including fundamental behind their complex structure;

CO3: Comprehend primary structure of the protein and various related data-sets.

CO4: Demonstrate the concept of gene sequence alignment and simulate various related algorithms for the same.

Text books

1.Pevzner, P. A., Computational Molecular Biology, PHI Learning Pvt. Ltd, ISBN-978-81-203-2550-0.
2.Ghosh, Z. and Mallick, B., Bioinformatics Principles and Applications (2008) Oxford University Press ISBN 9780195692303
3.Mount, D. W., Bioinformatics – sequence and genome analysis.

Reference Books

1.Devasena, T. (2012). Cell Biology. Published by Oxford University Press.
2.Fall, C.P., Marland, E.S., Wagner, J.M., Tyson, J.J.(2002). Computational Cell Biology. Springer
3.Becker, W. M., Kleinsmith, L. J., Hardin, J., & Raasch, J. (2003). The world of the cell (Vol. 6). San Francisco: Benjamin Cummings.
4.Rastogi, S. C. (2005). Cell biology. New Age International.
5.Reece, J. B., Taylor, M. R., Simon, E. J., & Dickey, J. (2009). Biology: concepts & connections (Vol. 3, p. 2). Pearson/Benjamin Cummings.

Course Code: BTIT511-18	**Course Title:** Artificial Intelligence	**3L:0T:0P**	**3Credits**

DETAIL CONTENTS:

UNIT1: **Introduction**

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree. [6hrs., CO1]

UNIT 2. Search Algorithms

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. [9hrs., CO2]

UNIT3. Probabilistic Reasoning

Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model. [10 hrs., CO3]

UNIT4. Markov Decision process

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs. [10 hrs., CO3]

UNIT5. Reinforcement Learning

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

[6hrs., CO4]

LIST OF SUGGESTED BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall

2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill

3. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.

4. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

Course Outcomes: At the end students shall be able to:

CO1: understand the basics of Artificial Intelligence

CO2: Understand and design the search algorithms used in AI

CO3: Integrate the mathematics backbone of required for solving AI based problems.

CO4: Determine the application of AI to solve problems and build logistics required for them.

Course Code: BTIT512-18	**Course Title: E-commerce lab**	**0L:0T:2P**	**1Credits**

LIST OF PRACTICALS

1. List and understand working of various broad band communication devices.

2. Write a programme to implement any one wireless application protocol

3. Write a programme to implement symmetric encryption.

4. Write a programme to implement DES

5. Write a programme to implement asymmetric encryption.

6. Write a programme to implement SET protocol

7. Mini project on Payment gateways.

Course Code: BTIT513-18	**Course Title: Cyber laws and IPR lab**	**0L:0T:2P**	**1Credits**

Students are expected to take minimum three case studies related to cyber crimes, IPR and copy rights and make their power point presentations.

The lab coordinator will allocate the topics.

Course Code: BTIT514-18	**Course Title:** Computational Biology Lab	**0L:0T:2P**	**1 Credits**

List of Experiments:

Task 1: Introduction of Bio Python, Various Packages and its Installation.

Task 2,3: Parsing sequence file formats
- Sequences and Alphabets
- Sequences act like strings
- Slicing a sequence
- Turning Seq objects into strings
- Concatenating or adding sequences
- Changing case
- Nucleotide sequences and (reverse) complements
- Transcription
- Translation

Task 4,5: Sequence annotation objects
- The SeqRecord object
- Creating a SeqRecord
  - SeqRecord objects from scratch
  - SeqRecord objects from FASTA files
  - SeqRecord objects from GenBank files
- Feature, location and position objects

SeqFeature objects
Positions and locations

Sequence described by a feature or location

Task 6,7,8: BLAST
- Running BLAST over the Internet
- Running BLAST locally
  - Introduction
  - Standalone NCBI BLAST+
  - Other versions of BLAST
- Parsing BLAST output
- The BLAST record class
- Dealing with PSI-BLAST
- Dealing with RPS-BLAST

BLAST and other sequence search tools
- The SearchIO object model
  - QueryResult
  - Hit
  - HSP
  - HSPFragment
- A note about standards and conventions
- Reading search output files
- Dealing with large search output files with indexing
- Writing and converting search output files

Task 9,10: Multiple Sequence Alignment objects
- Parsing or Reading Sequence Alignments
  - Single Alignments
  - Multiple Alignments
  - Ambiguous Alignments
- Writing Alignments
  - Converting between sequence alignment file formats
  - Getting your alignment objects as formatted strings
- Manipulating Alignments
  - Slicing alignments
  - Alignments as arrays

Task 11,12,13: Sequence motif analysis using Bio.motifs
- Motif objects
  - Creating a motif from instances
  - Creating a sequence logo
- Reading motifs
  - JASPAR
  - MEME
  - TRANSFAC
- Writing motifs
- Position-Weight Matrices

Quick Reference:
http://biopython.org/DIST/docs/tutorial/Tutorial.html#htoc106
https://biopython.readthedocs.io/en/latest/Tutorial/chapter_seq_objects.html

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Course Code: BTIT515-18	Course Title: Artificial Intelligence Lab	0L:0T:2P	1Credits

LIST OF PRACTICALS

1. Write a programme to conduct uninformed and informed search.

2. Write a programme to conduct game search.

3. Write a programme to construct a Bayesian network from given data.

4. Write a programme to infer from the Bayesian network.

5. Write a programme to run value and policy iteration in a grid world.

6. Write a programme to do reinforcement learning in a grid world.

7. Mini Project work.

Course code: HSMC122-18

Credits: 3

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and ExperientialValidation- as the process for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope

and characteristics of peoplefriendly and eco -friendly production systems, c. Ability to identify and develop appropriatetechnologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems.
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.
28. Sum up.
Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

3. READINGS:

3.1 Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

3.2 Reference Books

1. Jeevan Vidya: EkParichaya, A. Nagaraj, Jeevan VidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj -PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundational input. It would be desirable to follow it up by

a) Faculty -student or mentor-mentee programs throughout their time with the institution.

b) Higher level courses on human values in every aspect of living. E.g. as a professional.
