

**Scheme & Syllabus of**  
**Bachelor of Technology**  
**Information Technology**  
**Batch 2018 onwards**  
**(3<sup>rd</sup>-8<sup>th</sup>Sem.)-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
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>320</b>	<b>380</b>	<b>700</b>	<b>21</b>

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

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**Fourth Semester**

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

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

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**Fifth Semester**

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
BTIT 501-18	Professional Core Courses	Formal Language & Automata Theory	3	0	0	40	60	100	3
BTIT 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
HSMC12 2-18	Humanities & Social Sciences including Management Courses	Universal Human values-2	3	0	0	40	60	100	3
BTIT XXX-18	Professional Elective	Elective-I	3	0	0	40	60	100	3
MC	Mandatory Courses	Constitution of India/ Essence of Indian Traditional Knowledge	2	-	-	100	-	100	S/US
BTIT 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
<b>Total</b>			<b>20</b>	<b>0</b>	<b>10</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>23</b>

\* 4-6 weeks industrial training undertaken after 4<sup>th</sup> 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	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
<b>Total</b>			<b>15</b>	<b>0</b>	<b>14</b>	<b>380</b>	<b>420</b>	<b>800</b>	<b>22</b>

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**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
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>380</b>	<b>370</b>	<b>750</b>	<b>21</b>

**Seventh/ Eighth Semester**

Course Code	Course Title	Marks Distribution		Total Marks	Credits
		Internal	External		
<b>BTCS 801-18</b>	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 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** DataWarehousing and Mining
- BTIT 707-18** Ad-Hoc and Sensor Networks
- BTIT 708-18** Speech and Natural Language Processing
- BTIT 709-18** Network Programming

**BTIT 714-18** DataWarehousing and Mining lab

**BTIT 715-18** Ad-Hoc and Sensor Networks lab

**BTIT 716-18** Speech and Natural Language Processing lab

**BTIT 717-18** Network Programming lab

**Open electives offered by the department:**

**BTIT301-18** Data Structures & Algorithms

**BTIT302-18** Object Oriented Programming

**BTES302-18** Computer Architecture

**BTIT402-18** Operating System

**BTIT401-18** Computer Networks

**BTIT502-18** Database Management System



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**LIST OF COURSES FOR HONOURS DEGREE**

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

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

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

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

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

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

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
<b>BTIT51 1-18 &amp; BTIT51 5-18</b>	ELECTIVE	Artificial Intelligence Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BIT608- 18 &amp; BTIT61 6-18</b>	ELECTIVE	Machine Learning Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTIT61 3-18 &amp; BTIT62 1-18</b>	ELECTIVE	Cloud computing Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTIT50 8-18 &amp; BTIT51 2-18</b>	ELECTIVE	Ecommerce Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTCS61 6-18 &amp; BTCS61 7-18</b>	ELECTIVE	Data Science & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTIT61 1-18 &amp; BTIT61 9-18</b>	ELECTIVE	Management Information System Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTIT70 6-18 &amp; BTIT71 4-18</b>	ELECTIVE	Data Warehousing & Mining Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTCS60 8-18 &amp; BTCS60 9-18</b>	ELECTIVE	Internet of Things Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4
<b>BTIT70 4-18 &amp; BTIT71 2-18</b>	ELECTIVE	Soft Computing Theory & Lab	3	0	2	40T+30 P	60T+20 P	150	4

# *Third Semester*

<b>Course Code:</b> BTIT301-18	<b>Course Title:</b> Data Structure & Algorithms	<b>3L:0T:P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Module 1: Introduction**

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

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

**[6 hrs] (CO1)**

**Module 2: Stacks and Queues**

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

**[10 hrs] (CO2, CO4, CO5)**

**Module 3: Linked Lists**

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

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

**[10 hrs] (CO2, CO4, CO5)**

**Module 4: Sorting and Hashing**

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

**[10 hrs] (CO3)**

**Module 4: Graph**

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

**[6 hrs] (CO2, CO4)**

**Course Outcomes:**

The student will be able to:

1. For a given algorithm student will 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, 2<sup>nd</sup> 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.

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

**Detailed Contents:**

**Module 1: Introduction**

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

**[8 hrs] (CO1)**

**Module 2: Classes & Objects –II**

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

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

**Module 3: Inheritance**

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

**[8 hrs] (CO3, CO4)**

**Module 4: Virtual functions, Polymorphism**

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

**[8 hrs] (CO3, CO4)**

**Module 5: Exception Handling**

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

**[10 hrs] (CO5)**

**Course Outcomes:**

The student will be able to:

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

**Suggested Books:**

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

**Reference Books:**

1. Stanley B.Lippmann, JoseeLajoie: C++ Primer, 4th Edition, Addison Wesley, 2012.
2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2011.



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<b>Course Code:</b> BTES301-18	<b>Course Title:</b> Computer Architecture	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Module 1: Functional blocks of a computer**

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

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

**Module 2: Introduction to x86 architecture.**

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

**Memory system design:** semiconductor memory technologies, memory organization.

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

**[12 hrs] (CO2, CO4)**

**Module 3: Pipelining**

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

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

**Module 4: Memory Organization**

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

**[10 hrs] (CO3)**

**Course Outcomes:**

The student will be able to:

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

**Suggested Books:**

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

**Reference Books:**

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

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<b>Course Code:</b> BTIT303-18	<b>Course Title:</b> Data Structure & Algorithms Lab	<b>OL:0T:4P</b>	<b>2Credits</b>
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**List of Experiment:**

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

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

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

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

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

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

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

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

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

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

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

**Task 19:** Program to traverse graphs using BFS.

**Task 20:** Program to traverse graphs using DFS.

**Lab Outcomes:**

The student will be able to:

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

**Reference Books:**

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

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

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

**Lab Outcomes:**

The student will be able to:

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

**Reference Books:**

1. Stanley B.Lippmann, JoseeLajoie: C++ Primer, 4th Edition, Addison Wesley, 2012.
  2. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.
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<b>BTAM304-18</b>	<b>Mathematics Paper-III (Calculus and Ordinary Differential Equations)</b>	<b>3L:0T:0P</b>	<b>3 credits</b>
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**Detailed Contents:**

**Module 1:**

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

**Module 2:**

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

**Module 3:**

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

[CO4] (12 hrs.)

**Module 4:**

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

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

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

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

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

**Textbooks/References:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> 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, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
5. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
6. E.A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

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

**Module 1:**

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

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

**Module 2 :**

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

**Module 3:**

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

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

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

**Module 4:**

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

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

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

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

**Suggested Readings/ Books:**

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

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

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

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

### **Course Outcomes**

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

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



# *Fourth Semester*

<b>Course Code:</b> BTIT401-18	<b>Course Title:</b> Computer Networks	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Module 1: Data Communication Components**

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

**Module 2: Data Link Layer and Medium Access Sub Layer**

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

**Module 3: Network Layer**

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

**Module 4: Transport Layer**

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

**Module 5: Application Layer**

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

**Course Outcomes:**

The student will be able to:

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

**Suggested Books**

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

### **Reference Books**

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

#### **Module 1: Introduction**

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

**[6 hrs] (CO1)**

#### **Module 2: Processes**

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

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

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

**[10 hrs] (CO2, CO3)**

#### **Module 3: Inter-process Communication**

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

**Module 4: Deadlocks**

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

**[8 hrs] (CO3)**

**Module 5: Memory Management**

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

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

**[10 hrs] (CO4)**

**Module 6: I/O Hardware**

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

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

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

**[8 hrs] (CO5, CO6)**

**Course Outcomes:**

The student will be able to:

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

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

**Suggested Books:**

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

**Reference Books:**

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

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

**Detailed Contents:**

**Module 1: Introduction**

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

**Module 2: Fundamental Algorithmic Strategies**

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

**Module 3: Graph and Tree Algorithms**

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

**Module 4: Tractable and Intractable Problems**

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

**Module 5: Advanced Topics**

Approximation algorithms, Randomized algorithms, Heuristics and their characteristics. **[6 hrs] (CO1, CO4, CO5)**

**Course Outcomes:**

The student will be able to:

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

**Suggested Books:**

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

**Reference Books**

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

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<b>Course Code:</b> BTIT405-18	<b>Course Title:</b> Operating Systems Lab	<b>OL:OT:4P</b>	<b>2Credits</b>
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**List of Experiment:**

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

- 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.

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<b>Course Code:</b> BTIT406-18	<b>Course Title:</b> Design and Analysis of Algorithms Lab	<b>0L:0T:4P</b>	<b>2Credits</b>
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**List of Experiment:**

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

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

### **Lab Outcomes:**

The student will be able to:

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

### **Reference Books**

1. Data Structures and Algorithms in C++, Weiss, 4<sup>th</sup> 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.



<b>Course Code:</b> BTIT404-18	<b>Course Title:</b> Computer Networks Lab.	<b>OL:0T:2P</b>	<b>1Credits</b>
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**List of Experiments:**

Task1 : To study the different types of Network cables and network topologies

Task2 :Practically implement and test the cross-wired cable and straight through cable using clamping tool and network lab cable tester.

Task3 :Study and familiarization with various network devices.

Task4 :Familiarization with Packet Tracer Simulation tool/any other related tool.

Task5 :Study and Implementation of IP Addressing Schemes

Task6 :Creation of Simple Networking topologies using hubs and switches

Task7 :Simulation of web traffic in Packet Tracer

Task8 :Study and implementation of various router configuration commands

Task9 :Creation of Networks using routers.

Task10 :Configuring networks using the concept of subnetting

Task11 :Practical implementation of basic network command and Network configuration commands like ping, ipconfig, netstat , 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 subnetting;

5:Configure routers using various router configuration commands;&

6:Troubleshoot the networks by using various networking commands.

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

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

Natural resources and associated problems.

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

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

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

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

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

### **Module 3 : Biodiversity and its conservation**

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

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

and holocaust. Case Studies.

- Public awareness.

### **\*ACTIVITIES**

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

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

Following activities must be included.

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

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

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

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

#### **1(A) Awareness Activities:**

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

#### **Suggested Readings**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 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 Standards, 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

<b>Course Code: HSMC101-18</b>	<b>Course Title: Development of Societies</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Unit I: Social Development** (5 hours)

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

**Unit II: Political Development** (3 hours)

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

**Unit III: Economic Development** (18 hours)

1. Birth of Capitalism, Socialism, Marxism

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

**PROJECT: Possible projects in this course could be**

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

<b>Course Code: HSMC102-18</b>	<b>Course Title: PHILOSOPHY</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Unit 1:**

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

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

**Unit 2:**

Origin of the Universe:

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

**Unit 3:**

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

**Unit 4:**

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

**ASSESSMENT (indicative only):**

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

**OUTCOME OF THE COURSE:**

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

<b>BTCS401-18</b>	<b>Discrete Mathematics</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Detailed contents:**

**Module 1:**

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

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

**Module 2:**

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

**Module 3:**

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

**Module 4:**

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

**Module 5:**

**Graphs and Trees:** Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs,

**IK Gujral Punjab Technical University, Kapurthala**  
**B. Tech, Information Technology**

Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances. CO5

**Suggested books:**

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

**Suggested reference books:**

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

**Course Outcomes**

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

**Detailed Contents**

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

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages. Intractability: 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.
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<b>Course Code:</b> BTIT502-18	<b>Course Title:</b> Database Management Systems	<b>3L:0T:0P</b>	<b>3Credits</b>	<b>42 Hours</b>
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**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”, 5<sup>th</sup> Edition by R. Elmasri and S. Navathe, Pearson Education.
3. “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

**Detailed Contents:**

**UNIT1:**

<b>Course Code:</b> BTIT503-18	<b>Course Title:</b> Programming in Java	<b>3L:0T:0P</b>	<b>3Credits</b>	<b>42 Hours</b>
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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 operators, 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 database 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.

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<b>Course Code:</b> BTIT504-18	<b>Course Title:</b> Software Engineering	<b>3L:1T:0P</b>	<b>3Credits</b>	<b>42 Hours</b>
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**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
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**B. Tech, Information Technology**

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

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<b>Course Code:</b> BTIT506-18	<b>CourseTitle:</b> Prog. In Java lab	<b>0L:0T:2P</b>	<b>1Credits</b>	<b>2 Hours/week</b>
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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 operators, 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

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

<b>Course Code:</b> BTIT509-18	<b>Course Title:</b> Cyber laws and IPR	<b>3L:0T:0P</b>	<b>3Credits</b>
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### **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.

**Detailed Contents:**

<b>Course Code:</b> BTIT508-18	<b>Course Title:</b> E-Commerce	<b>3L:0T:0P</b>	<b>3Credits</b>
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**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. Denial 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.

<b>Course Code:</b> BTIT510-18	<b>Course Title:</b> Computational Biology	<b>3L:0T:0P</b>	<b>3Credits</b>
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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, Krebs'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.
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<b>Course Code:</b> BTIT511-18	<b>Course Title:</b> Artificial Intelligence	<b>3L:0T:0P</b>	<b>3Credits</b>
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**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 Artificial 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.

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<b>Course Code: BTIT512-18</b>	<b>Course Title: E-commerce lab</b>	<b>0L:0T:2P</b>	<b>1Credits</b>
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**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.

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<b>Course Code:</b> BTIT513-18	<b>Course Title:</b> Cyber laws and IPR lab	<b>0L:0T:2P</b>	<b>1Credits</b>
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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.

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<b>Course Code:</b> BTIT514-18	<b>Course Title:</b> Computational Biology Lab	<b>0L:0T:2P</b>	<b>1 Credits</b>
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**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](https://biopython.readthedocs.io/en/latest/Tutorial/chapter_seq_objects.html)

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<b>Course Code:</b> BTIT515-18	<b>Course Title:</b> Artificial Intelligence Lab	<b>0L:0T:2P</b>	<b>1Credits</b>
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**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.

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**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 Experiential Validation- 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 ensure Sanyam 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 appropriate technologies 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.
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# SIXTH SEMESTER

<b>Course Code:</b> BTIT 601-18	<b>Course Title :</b> Big Data	<b>3L:0T:0P</b>	<b>3Credits</b>
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### **Unit 1**

Introduction to Big Data: Types of Digital Data-Characteristics of Data – Evolution of Big Data - Definition of Big Data - Challenges with Big Data - 3Vs of Big Data - Non Definitional traits of Big Data - Business Intelligence vs. Big Data - Data warehouse and Hadoop environment - Coexistence. Big Data Analytics: Classification of analytics - Data Science - Terminologies in Big Data - CAP Theorem - BASE Concept. NoSQL: Types of Databases – Advantages – NewSQL - SQL vs. NOSQL vs NewSQL. Introduction to Hadoop: Features – Advantages – Versions - Overview of Hadoop Eco systems - Hadoop distributions - Hadoop vs. SQL – RDBMS vs. Hadoop - Hadoop Components – Architecture – HDFS - Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting - Compression. Hadoop 2 (YARN): Architecture - Interacting with Hadoop Eco systems.

**[10hrs] (CO 1, CO2)**

### **Unit 2**

No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export. Cassandra: Introduction – Features - Data types – CQLSH - Key spaces - CRUD operations – Collections – Counter – TTL - Alter commands - Import and Export - Querying System tables.

**[8hrs] (CO 3)**

### **Unit 3**

Hadoop Eco systems: Hive – Architecture - data type - File format – HQL – SerDe - User defined functions - Pig: Features – Anatomy - Pig on Hadoop - Pig Philosophy - Pig Latin overview - Data types - Running pig - Execution modes of Pig - HDFS commands - Relational operators - Eval Functions - Complex data type - Piggy Bank - User defined Functions - Parameter substitution - Diagnostic operator. Jasper Report: Introduction - Connecting to Mongo DB - Connecting to Cassandra

**[8hrs] (CO 4)**

### **Unit 4**

Analytical Approaches, Introducing to various Analytical Tools, Installing R, Handling Basic Expressions in R, Variables in R, working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, interacting with Users, Handling Data in R Workspace, Executing Scripts, Reading Datasets and Exporting Data from R, Manipulating and Processing Data in R, working with Functions and Packages in R, Performing Graphical Analysis in R, Techniques Used for Visual Data Representation, Types of Data Visualization

**[10 hrs] (CO 5)**

### **Suggested Readings/ Books:**

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publication, 2015.
2. Big Data, Black Book by DT Editorial Services, Dreamtech Press.
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “Big Data for Dummies”, John Wiley & Sons, Inc., 2013.



4. Tom White, “Hadoop: The Definitive Guide”, O’Reilly Publications, 2011.
5. Kyle Banker, “Mongo DB in Action”, Manning Publications Company, 2012.
6. Russell Bradberry, Eric Blow, “Practical Cassandra A developers Approach“, Pearson Education, 2014.

**Course Outcomes**

- CO1:** Understand fundamental concepts of Big Data and its technologies  
**CO2:** Apply concepts of MapReduce framework for optimization  
**CO3:** Analyze appropriate NoSQL database techniques for storing and processing large volumes of structured and unstructured data  
**CO4:** Understand various components of Hadoop ecosystems  
**CO5:** Explore modern tools and packages for data visualization

<b>Course Code: BTIT 604 -18</b>	<b>Course Title : Big Data Lab</b>	<b>0L:0T:2P</b>	<b>3Credits</b>
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**Detailed List of Tasks:**

1. (i) Perform setting up and Installing Hadoop in its two operating modes:
  - Pseudo distributed,
  - Fully distributed.
2. Use web based tools to monitor your Hadoop setup.
3. Implement the following file management tasks in Hadoop:
  - Adding files and directories
  - Retrieving files
  - Deleting files
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
  - Find the number of occurrence of each word appearing in the input file(s)
  - Performing a MapReduce Job for word search count (look for specific keywords in a file)
5. Stop word elimination problem:
  - Input:
    - o A large textual file containing one sentence per line
    - o A small file containing a set of stop words (One stop word per line)
  - Output:
    - o A textual file containing the same sentences of the large input file without the words appearing in the small file.
6. Using various mathematical functions on console in R
7. Write an R script, to create R objects for calculator application and save in a specified location in disk.
8. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets
9. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
  - Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
  - Reading Excel data sheet in R.
  - Reading XML dataset in R.
10. Visualizations using R packages
  - Find the data distributions using box and scatter plot.
  - Find the outliers using plot.

- Plot the histogram, bar chart and pie chart on sample data.

**Suggested Tools: -**

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- RStudio
- Apache Hadoop
- Oracle VM Virtual Box

<b>Course Code: BTIT602-18</b>	<b>Course Title: Web Technologies</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Detailed Contents:**

**Module 1:**

**Introduction:** History and evolution of Internet protocols, Internet addressing, Internet Service Provider (ISP), Introduction to WWW, DNS, URL, HTTP, HTTPS, SSL, Web browsers, Cookies, Web servers, Proxy servers, Web applications. Website design principles, planning the site and navigation.

[6 hrs][CO1]

**Module 2:**

**HTML and DHTML:** Introduction to HTML and DHTML, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images, Multimedia, Links, Audio, Video, Table and Forms, Document Layout, HTML vs. DHTML, Meta tags, Browser architecture and Website structure. Overview and features of HTML5.

[7 hrs][CO2]

**Module 3:**

**Style Sheets:** Need for CSS, Introduction to CSS, Basic syntax and structure, Types of CSS – Inline, Internal and External CSS style sheets. CSS Properties - Background images, Colors and properties, Text Formatting, Margin, Padding, Positioning etc., Overview and features of CSS3.

[7 hrs][CO3]

**Module 4:**

**Java Script:** Introduction, JavaScript's history and versions, Basic syntax, Variables, Data types, Statements, Operators, Functions, Arrays, Objects, dialog boxes, JavaScript DOM.

[7

hrs][CO4]

**Module 5:**

**PHP and MySQL:** Introduction and basic syntax of PHP, Data types, Variables, Decision and looping with examples, String, Functions, Array, Form processing, Cookies and Sessions, E-mail, PHP-MySQL: Connection to server.

[7 hrs][CO5]

**Module 6:**

**Ajax and JSON:** AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax, Advantages & disadvantages, HTTP request, XMLHttpRequest Server Response. JSON– Syntax,

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**B. Tech, Information Technology**

Schema, Data types, Objects, Reading and writing JSON on client and server. Using JSON in AJAX applications. [8 hrs][CO6]

**Students shall be able to:**

- CO1. Understand and apply the knowledge of web technology stack to deploy various web services.
- CO2. Analyze and evaluate web technology components for formulating web related problems.
- CO3. Design and develop interactive client server internet application that accommodates user specific requirements and constraint analysis.
- CO4. Program latest web technologies and tools by creating dynamic pages with an understanding of functions and objects.
- CO5. Apply advance concepts of web interface and database to build web projects in multidisciplinary environments.
- CO6. Demonstrate the use of advance technologies in dynamic websites to provide performance efficiency and reliability for customer satisfaction.

**Text Books:**

- 1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education
- 2. Rajkamal, "Internet and Web Technology", Tata McGraw Hill
- 3. Ray Rischpater, "JavaScript JSON Cookbook", Packt Publishing.
- 4. Ivan Bayross, "Web Enabled Commercial Application Development using HTML, DHTML JavaScript, Perl, CGI", BPB Publications.
- 5. Peter Moulding, "PHP Black Book", Coriolis.

<b>Course Code: BTIT605-18</b>	<b>Course Title: Web Technologies Lab</b>	<b>0L:0T:2P</b>	<b>1 credits</b>
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**List of Experiments:**

- 1. Configuration and administration Apache Web Server.
- 2. Develop an HTML page to demonstrate the use of basic HTML tags, Link to different HTML page and also link within a page, insertion of images and creation of tables.
- 3. Develop a registration form by using various form elements like input box, text area, radio buttons, check boxes etc.
- 4. Design an HTML page by using the concept of internal, inline, external style sheets.
- 5. Create an HTML file to implement the styles related to text, fonts, links using cascading style sheets
- 6. Create an HTML file to implement the concept of document object model using JavaScript
- 7. Create an HTML page including JavaScript that takes a given set of integer numbers and shows them after sorting in descending order.

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**B. Tech, Information Technology**

8. Write an HTML page including any required JavaScript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.
9. Create a PHP file to print any text using variable.
10. Demonstrate the use of Loops and arrays in PHP
11. Create a PHP file using GET and POST methods.
12. A simple calculator web application that takes two numbers and an operator (+, -, /, \* and %) from an HTML page and returns the result page with the operation performed on the operands.
13. Implement login page contains the user name and the password of the user to authenticate with Session using PHP and MySQL, also implement this with the help of PHP-Ajax.
14. A web application for implementation:
  - a. The user is first served a login page which takes user’s name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
  - b. If name and password matches, serves a welcome page with user’s full name.
  - c. If name matches and password doesn’t match, then serves “password mismatch” page
  - d. If name is not found in the database, serves a registration page, where user’s full name is asked and on submitting the full name, it stores, the login name, password and full name in the database (hint: use session for storing the submitted login name and password)
15. Demonstrate the use of Ajax and JSON Technologies in programming examples.
  
16. Demonstrate the use of web site designing tools such as Joomla, WordPress.
17. Implement at least one minor project using different technologies mentioned in theory of the subject.

# ELECTIVES II

<b>Course Code: BTIT 606-18</b>	<b>Course Title : Fundamentals of Virtualization</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1:** Introduction to Virtualization

Physical and Virtual Machines, Traditional and Virtual Computing, Understanding virtualization, Need, Limitation and Applications of virtualization, Simulations and Emulations, Challenges in Virtualized Environment, Tools and Technologies in virtualized environments. **[8hrs] (CO 1)**

**UNIT 2:** File Systems

Memory and Storage, File systems, Distributed file systems, Map and Reduce, Hadoop File Systems, Google File System, Big table. Various forms of virtualization: Desktop, Application, Server, Hardware, Storage, Memory and I/O virtualization **[9hrs] (CO 2)**

**UNIT 3:** Server Virtualization

Server consolidation, Privileged Instructions, Binary translation, Hypervisors, Types of Hypervisors, Hypervisor Architecture, Full virtualization, Para Virtualization, Hardware Assisted virtualization, Implementation of hardware Assisted virtualization, Algorithms for Implementation of virtualization of virtualization, Challenges. **[6hrs] (CO 3)**

**UNIT 4** VM Management and Storage virtualization

VM lifecycle, Process and system level VMs, VM configurations, VM migrations, Migration types and process, VM provisioning, scaling, VM scheduling, load balancing: significance, types and algorithms, RAID, SCSI, iSCSI, Direct attached storage, Network Attached storage, Storage Area network. **[6hrs] (CO 4)**

**UNIT 5** Virtualization Performance and security

Performance issues, virtual machine sprawling, Hypervisor vulnerabilities, Hypervisor attacks, VM attacks, VM migration attacks, Security Solutions **[6hrs] (CO 5)**

**Course Outcomes:**

**After learning the course the students should be able to**

**CO1:** Understanding Virtual machines and Implementation of virtual machines

**CO2:** Understanding virtualization and various ways of using virtualization

**CO3:** Implementation of private cloud platform using virtualization

**CO4:** Use virtual machines of public cloud platform

**Suggested Readings/ Books:**

**Text Books:**

1 Chris Wolf and Erick M. Halter, “Virtualization” A press; 1 edition 2005.

2 LatifaBoursas (Editor), Mark Carlson (Editor), Wolfgang Hommel (Editor), Michelle Sibilla (Editor), KesWold (Editor), “Systems and Virtualization Management: Standards and New Technologies”, October 14, 2008

**Reference Books**

1 Massimo Cafaro (Editor), Giovanni Aloisio (Editor), “Grids, Clouds and Virtualization” Springer; edition 2011.

2 Edward L. Haletky, “VMware ESX Server in the enterprise”. Prentice Hall; 1 edition 29 Dec 2007.

3 Gaurav Somani, “Scheduling and Isolation in Virtualization”, VDM VerlagDr.Müller [ISBN: 978- 3639295139], Muller Publishers, Germany, Sept. 2010

4 Edward Haletky, “VMware ESX and ESXi in the Enterprise – Planning Deployment of Virtualization Servers” [ISBN: 978-0137058976]., Prentice Hall; 2 edition February 18, 2011.

<b>Course Code: BTIT 614-18</b>	<b>Course Title: Fundamentals of Virtualization lab</b>	<b>L:0;T:0; 2P:</b>	<b>1Credits</b>
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**Detailed List of Tasks:**

1. Creating Private cloud using Virtualization tool(XEN)
2. Working with Virtual machine in Public cloud(AWS/Azure)
3. Hadoop Installation and Working with HDFS
4. Map reduce programming on pubic cloud
5. Virtual machine migration and cloning on private cloud
6. Implementation of Storage virtualization using FreeNAS
7. Load balancing on public cloud platform

**Suggested Tools:**

**The virtualization systems management tools that currently have the greatest market share include:**

- **VMware** vCenter and vRealize Suite (many of the third-party tools have similarities to the vRealize Suite)
- **Microsoft System Center Virtual Machine Manager.**
- **Citrix Systems XenCenter.**
- **VMTurbo Operations Manager.**
- **Dell Foglight.**

<b>CourseCode: BTIT607-18</b>	<b>CourseTitle: Distributed Systems</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**Unit-1:** Introduction to Distributed systems, Operating Systems, Types of distributed systems, Concurrent Programming, Characteristics & Properties of Distributed Systems – Taxonomy - Design goals – Transparency Issues.

System architectures; Centralized, Decentralized and Hybrid architectures, Architectures versus middleware, Self-management in distributed systems, feedback control model.

**[7hrs] (CO 1)**

**Unit 2:** Processes and communication: Introduction to threads, Threads in distributed systems, role of virtualization in distributed systems, Clients, Servers, Code migration and approaches to code migration.

Types of communication, Layered protocols and its types, Remote procedure call, Basic RPC operation, Parameter passing, Asynchronous RPC, Message-oriented transient and persistent communication.

**[7hrs] (CO 2)**

**Unit 3:** Naming and Synchronization: Names, identifiers, and addresses, concept of flat naming, Structured naming and attribute based naming.

Coordination and clock synchronization, Logical clocks, Mutual exclusion, distributed mutual exclusion, Global positioning of nodes and election algorithms.

**[7hrs] (CO 3)**

**Unit 4:** Consistency and replication: Introduction, reasons for replication, Data-centric consistency models; Continuous consistency, Sequential consistency, Causal consistency, Client-centric consistency, Eventual consistency, Monotonic reads and writes.

Replica management; Replica-server placement, Content replication and placement and Content distribution.

**[7hrs] (CO 4)**

**Unit 5:** Security and Fault tolerance: Security threats, policies, and mechanisms, Design issues, Cryptography, Access control and Security management.

Introduction to fault tolerance, Process resilience, Reliable group communication, Recovery.

**[7hrs] (CO 5)**



**Course Outcomes:**

**After undergoing this course, the students will be able to learn about:**

CO1: Basic principles of distributed systems, its types, properties and architecture.

CO2: Concepts of threats in Distributed systems and types of communications.

CO3: Coordination and synchronization principles in distributed systems

CO4: Fundamentals of various types of consistency and replica management techniques.

CO5: Concepts related to fault tolerance, recovery and security mechanisms.

**Suggested Readings/ Books:**

1. A S Tanenbaum, Martin Steen, "Distributed Systems: Principles and Paradigms",  
2/E, PHI
2. Colouris, Dollimore, Kindberg, "Distributed Systems Concepts & Design", 4/E, Pearson  
Ed.

Course Code: <b>BTIT 608-18</b>	Course Title : <b>Machine Learning</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1: Introduction:** Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning, Unsupervised learning and Reinforcement learning.

**[4hrs] (CO 1)**

**UNIT 2: Data Pre-processing:** Need of Data Pre-processing, Data Pre-processing Methods: Data Cleaning, Data Integration, Data Transformation, Data Reduction; Feature Scaling (Normalization and Standardization), Splitting dataset into Training and Testing set.

**[4hrs] (CO 2)**

**UNIT 3: Regression:** Need and Applications of Regression, Simple Linear Regression, Multiple Linear Regression and Polynomial Regression, Evaluating Regression Models Performance (RMSE, Mean Absolute Error, Correlation, RSquare, Accuracy with acceptable error, scatter plot, *etc.*)

**[6hrs] (CO 3)**

**UNIT 4 Classification:** Need and Applications of Classification, Logistic Regression, Decision tree, Tree induction algorithm – split algorithm based on information theory, split algorithm based on Gini index; Random forest classification, Naïve Bayes algorithm; K-Nearest Neighbours (K-NN), Support Vector Machine (SVM), Evaluating Classification Models Performance (Sensitivity, Specificity, Precision, Recall, *etc.*). **Clustering:** Need and Applications of Clustering, Partitioned methods, Hierarchical methods, Density-based methods.

**[12hrs] (CO 4)**

**UNIT 5 Association Rules Learning:** Need and Application of Association Rules Learning, Basic concepts of Association Rule Mining, Naïve algorithm, Apriori algorithm. **Artificial Neural Network:** Need and Application of Artificial Neural Network, Neural network representation and working, Activation Functions. **Genetic Algorithms:** Basic concepts, Gene Representation and Fitness Function, Selection, Recombination, Mutation and Elitism.

**[14hrs] (CO 5)**

**Course Outcomes:**

After undergoing this course, the students will be able to:

CO1: Analyse methods and theories in the field of machine learning

CO2: Analyse and extract features of complex datasets

CO3: Deploy techniques to comment for the Regression

CO4: Comprehend and apply different classification and clustering techniques

CO5: Understand the concept of Neural Networks and Genetic Algorithm

**Suggested Readings/ Books:**

Text Books:

1. Mitchell M., T., Machine Learning, McGraw Hill (1997) 1stEdition.
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2014) 3rdEdition.
3. Vijayvargia Abhishek, Machine Learning with Python, BPB Publication (2018)

Reference Books:

1. Bishop M., C., Pattern Recognition and Machine Learning, Springer-Verlag (2011) 2ndEdition.
2. Michie D., Spiegelhalter J. D., Taylor C. C., Campbell, J., Machine Learning, Neural and Statistical Classification. Overseas Press (1994).

<b>Course Code: BTIT616-18</b>	<b>Course Title: Machine Learning Lab</b>	<b>L:0;T:0;2 P:</b>	<b>1Credits</b>
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**Detailed List of Tasks:**

1. Implement data pre-processing
2. Deploy Simple Linear Regression
3. Simulate Multiple Linear Regression
4. Implement Decision Tree
5. Deploy Random forest classification
6. Simulate Naïve Bayes algorithm
7. Implement K-Nearest Neighbors (K-NN), k-Means
8. Deploy Support Vector Machine, Apriori algorithm
9. Simulate Artificial Neural Network

10. Implement the Genetic Algorithm code

**Suggested Tools** Python/R/MATLAB

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<b>Course Code: BTIT 609-18</b>	<b>Course Title : Agile Software Development</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1: Introduction**

Need of Agile software development, History of Agile, Agile context– manifesto, principles, methods, values. The benefits of agile in software development.

**[6hrs] (CO 1)**

**UNIT 2: Agile Design Methodologies**

Fundamentals, Design principles–Single responsibility, Open-closed, Liskov-substitution, Dependency-inversion, Interface-segregation.

**[6hrs] (CO 2)**

**UNIT 3: Scrum**

Introduction to scrum framework, Roles: Product owner, team members and scrum master, Events: Sprint, sprint planning, daily scrum, sprint review, and sprint retrospective, Artifacts: Product backlog, sprint backlog and increments. User stories- characteristics and contents.

**[8hrs] (CO 3)**

**UNIT 4: Kanban**

Introduction to Kanban framework, Workflow, Limit the amount of work in progress, pulling work from column to column, Kanban board, Adding policies to the board, Cards and their optimization.

**[6hrs] (CO 4)**

**UNIT 5: Extreme Programming**

Basic values and principles, Roles, Twelve practices of XP, Pair programming, XP team, Life cycle and tools for XP.

**[6hrs] (CO 5)**

**UNIT 6: Agile Testing**

The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous

integration, Code refactoring. Risk based testing, Regression tests, Test automation. **[6hrs]**

**(CO 6)**

**Course Outcomes:**

After undergoing this course, the students will be able to:

CO1: Understand concept of agile software engineering and its advantages in software development.

CO2 Explain the role of design principles in agile software design.

CO3 Define the core practices behind Scrum framework.

CO4 Understand key principles of agile software development methodology-Kanban.

CO5 Describe implications of functional testing, unit testing, and continuous integration.

CO6 Understand the various tools available to agile teams to test the project.

**Suggested Readings/ Books:**

1. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", Pearson.
2. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall.
3. Mike Cohn, "User Stories Applied: For Agile Software Development", Addison Wesley Signature Series.
4. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley.
5. Paul VII, "Agile: The Complete Overview of Agile Principles and Practices (Agile Product Management)".
6. Robert Martin, "Agile Software Development, Principles, Patterns, and Practices", Pearson New International Edition.
7. Greene Jennifer," Learning Agile", O'Reilly Series.

<b>Course Code:BTIT 617-18</b>	<b>Course Title : Agile Software Development Lab</b>	<b>L:0T:2P</b>	<b>1Credits</b>
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**Detailed List of Tasks:**

1. Understand the background and driving forces for taking an Agile Approach to Software Development.
  2. Build out a backlog and user stories.
  3. To study automated build tool.
  4. To study version control tool.
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5. To study Continuous Integration tool.
  6. Apply Design principle and Refactoring to achieve agility.
  7. Perform Testing activities within an agile project.
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# ELECTIVE III

<b>Course Code: BTIT 610-18</b>	<b>Course Title : Cryptography and Network Security</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1:** Introduction (3 Hours)

Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks, Security services and mechanism, Conventional Encryption Model, CIA model

**[5hrs] (CO 1)**

**UNIT 2:** Math Background

Modular Arithmetic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem

**[5hrs] (CO 1)**

**UNIT 3:** Cryptography

Dimensions of Cryptography, Classical Cryptographic Techniques Block Ciphers (DES, AES) : Feistel Cipher Structure, Simplified DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations Public-Key Cryptography : Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie- Hellman Key Exchange, Elgamal Algorithm, Elliptic Curve Cryptography

**[12hrs] (CO 2)**

**UNIT 4** Hash and MAC Algorithms

Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Key Management : Key Distribution Techniques, Kerberos

**[6hrs] (CO 3)**

**UNIT 5** Security in Networks

Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME

**[7hrs] (CO 4)**

**Course Outcomes:**

After undergoing this course, the students will be able to:

CO1: Understand the fundamental principles of access control models and techniques, authentication and secure system design

CO2: Have a strong understanding of different cryptographic protocols and techniques and be able to use them.

CO3: Apply methods for authentication, access control, intrusion detection and prevention.

CO4: Identify and mitigate software security vulnerabilities in existing systems.

**Suggested Readings/ Books:**

1. Cryptography And Network Security Principles And Practice Fourth Edition, William Stallings, Pearson Education
2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
4. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.

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<b>Course Code: BTIT 618-18</b>	<b>Course Title: Cryptography and Network Security Lab</b>	<b>L:0;T:0; P:</b>	<b>Credits</b>
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**Detailed List of Tasks:**

1. W.A.P. to implement Ceaser Cipher
2. W.A.P. to implement Affine Cipher with equation  $c=3x+12$
3. W.A.P. to implement Playfair Cipher with key ldrp
4. W.A.P. to implement polyalphabetic Cipher
5. W.A.P. to implement AutoKey Cipher
6. W.A.P. to implement Hill Cipher. (Use any matrix but find the inverse yourself)
7. W.A.P. to implement Rail fence technique
8. W.A.P. to implement Simple Columner Transposition technique
9. W.A.P. to implement Advanced Columner Transposition technique
10. W.A.P. to implement Euclidean Algorithm
11. W.A.P. to implement Advanced Euclidean Algorithm
12. W.A.P. to implement Simple RSA Algorithm with small numbers

**Suggested Tools -**

**MANAGEMENT INFORMATION SYSTEMS**

**L 3 T 0 P 0**

**BTIT 611-18**

**Credits 3**

**Module 1: Fundamentals of Information Systems:**

The Fundamental Roles of Information System in Business, Trends in Information Systems, The Role of e-Business, Types of Information Systems, Components of Information Systems, Information System Resources, Information System Activities, Strategic Uses of Information Technology. **[8hrs] (CO1)**

**Module 2: e-Business Systems**



Introduction, Cross-Functional Enterprise Applications, Enterprise Application Integration, Transaction Processing Systems, Enterprise Collaboration Systems, Functional Business Systems, Marketing Systems , Manufacturing Systems, Human Resource Systems, Accounting Systems, Financial Management Systems **[8hrs] (CO2)**

### **Module 3: Enterprise Business Systems**

Customer Relationship Management, Three Phases of CRM, Benefits and Challenges of CRM, Trends in CRM, Enterprise Resource Planning, Benefits and Challenges of ERP, Trends in ERP, Supply Chain Management, Benefits and Challenges of SCM, Trends in SCM. **[8hrs] (CO3)**

### **Module 4: e-Commerce Systems**

Introduction to e-Commerce, The Scope of e-Commerce, Essential e-Commerce Processes, Electronic Payment Processes, e-Commerce Applications and Issues, Business-to-Consumer e-Commerce, Business-to-Business e-Commerce. **[6hrs] (CO4)**

### **Module 5: Decision Support System**

Introduction, Decision Support Trends, Decision Support Systems, Management Information Systems, Online Analytical Processing, Executive Information Systems, Knowledge Management Systems, Artificial Intelligence Technologies in Business, Expert Systems, Components of an Expert System, Expert System Applications, Benefits of Expert Systems, Limitations of Expert Systems. **[10hrs] (CO4)**

**Course Outcomes:** The student will be able to:

**CO1:** Understand the role of Information System and its strategic use

**CO2:** Understand the concept of Enterprise Applications and its various types

**CO3:** Learn about core concepts of CRM, ERP and SCM

**CO4:** Know about e-commerce platforms along with intelligent decision support system.

### **Text Books**

1. Management Information systems, James A. O'Brien, George M. Marakas, McGraw Hill Publishing Company Limited.

### **Reference Books**

1. Management Information Systems- Managing the Digital Firm, Kenneth C. Laudon, Jane P. Laudon, Pearson Education Limited.
2. Management Information Systems, Kenneth J. Sousa, Effy Oz, Cengage Learning.

**MANAGEMENT INFORMATION SYSTEMS LAB**

**L O T O P 2**

**BTIT 619-18**

**Credits 1**

**List of Experiments:**

1. Prepare a case study to show the importance of Information System in developing a Business. **(CO1)**
2. Plan some Information System Activities for the Strategic Uses of Information Technology in e-commerce business. **(CO1)**
3. Prepare a real world case study based on CRM for an online start-up business. **(CO2)**
4. Design an ERP model for an organisation involved in data management. **(CO2)**
5. Prepare a real world case study to discuss how SCM helps enterprise to optimise resources. **(CO2)**
6. Study and analyse a real world online business model involved in B2C activities. **(CO3)**
7. Study and analyse a real world business model involved in B2B activities with its advantages. **(CO3)**
8. Discuss a case study to highlight the importance of Decision Support System in real world. **(CO4)**
9. Develop an Expert System model for an organisation involved in research and development activities of medicines. **(CO4)**
10. Highlight some case studies where Artificial Intelligence based Technologies played a key role in developing Business. **(CO4)**

**Course Outcomes:** The student will be able to:

**CO1:** Study the role of Information System in real world case studies.

**CO2:** Understand working models of CRM, ERP and SCM

**CO3:** Learn about B2B, B2C activities with real world examples.

**CO4:** Learn to understand DSS, Expert System in developing business applications.

<b>Course Code:</b> <b>BTIT 612-18</b>	<b>Course Title : Digital Image Processing</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1: Introduction of Digital Image Processing (DIP)**

Introduction to the DIP areas and applications; Components of Digital Image Processing; Elements of Visual Perception; Image Sensing and Acquisition; Image Sampling and Quantization; Relationships between pixels; color models.

[7hrs] (CO 1)

**UNIT 2: Image Enhancement**

**Spatial Domain:** Gray level transformations; Histogram processing; Basics of Spatial Filtering; Smoothing and Sharpening Spatial Filtering

**Frequency Domain:** Introduction to Fourier Transform; Smoothing and Sharpening frequency domain filters; Ideal, Butterworth and Gaussian filters

[10hrs] (CO 2)

**UNIT 3: Image Restoration**

Noise models; Mean Filters; Order Statistics; Adaptive filters; Band reject Filters; Band pass Filters; Notch Filters; Optimum Notch Filtering; Inverse Filtering; Wiener filtering

[8hrs]

(CO 3)

**UNIT4: Feature Extraction and Image Segmentation**

**Feature Extraction:** Contour and shape dependent feature extraction, Extraction of textural features

**Segmentation:** Detection of Discontinuities; Edge Linking and Boundary detection; Region based segmentation; Morphological processing- erosion and dilation.

[10hrs] (CO 4)

**UNIT 5: Image Compression and Encoding**

Entropy-based schemes, Transform-based encoding, Predictive encoding and DPCM, Vector quantization, Huffman coding.

[10hrs](CO 5)

**Course Outcomes:**

After undergoing this course, the students will be able to:

CO1: Understand the basic concepts of DIP.

CO2: Improve the quality of digital images.

CO3: Understand and De-noise Digital Images

CO4: Segment digital images and extract various features from digital images

CO5: Understand various image compression techniques and apply such techniques to compress digital images for reducing the sizes of digital images.

**Suggested Readings/ Books:**

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, "Digital Image Processing", John Willey, 2002.
4. Nick Efford, "Digital Image Processing a practical introduction using Java", Third Edition, Pearson Education, 2004.
5. R.C. Gonzalez, R.E. Woods, and S. L. Eddins "Digital Image Processing using MATLAB", Pearson Prentice-Hall, 2004.

6. Sandipan Dey, "Hands-On Image Processing with Python", Packt, 2018

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<b>Course Code:</b> BTIT 620-18	<b>Course Title: Digital Image Processing Lab</b>	<b>L:0;T:0; P:</b>	<b>Credits</b>
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**Detailed List of Tasks:**

11. WAP to draw Histogram of digital Image
12. WAP to enhance the quality of digital image using various gray level transformations.
13. WAP to enhance the quality of digital image using Average and median filters in spatial domain.
14. WAP to convert digital image from spatial domain to frequency domain.
15. Implement low pass filters in frequency domain for image enhancement.
16. Implement high pass filters in frequency domain for image enhancement.
17. Implement Optimum Notch Filtering for de-noising of digital image.
18. WAP to segment digital image using thresholding approach.
19. WAP to extract shape and texture based features from image.
20. WAP to compress digital image using entropy based approach.

**Suggested Tools – MATLAB/Python/JAVA**

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<b>Course Code: BTIT613-18</b>	<b>Course Title: Cloud Computing</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT1: Introduction** : Definition of cloud, characteristics of cloud, historical developments & challenges ahead, the vision of cloud computing, Driving factors towards cloud, Comparing grid with utility computing, cloud computing and other computing systems, types of workload patterns for the cloud, IT as a service, Applications of cloud computing.

**[8hrs] (CO1)**

**UNIT2: Cloud computing concepts:** Introduction to virtualization techniques, Characteristics of virtualization, Pros and Cons of virtualization Technology, Hypervisors, Types of hypervisors, Multitenancy, Application programming interfaces (API), Elasticity and scalability.

**[9hrs] (CO2)**

**UNIT 3: Cloud service models:** Cloud service models, Infrastructure as a service (IaaS) architecture- details and example, Platform as a service (PaaS) architecture- details and example, Software as a service (SaaS) architecture-- details and example, Comparison of cloud service delivery models.

**[6hrs] (CO3)**

**UNIT 4: Cloud deployment models:** Introduction to cloud deployment models, Public clouds, Private clouds, Hybrid clouds, Community clouds, Migration paths for cloud, Selection criteria for cloud deployment.

**[6hrs] (CO4)**

**UNIT 5: Security in cloud computing:** Understanding security risks, Principal security dangers to cloud computing, Internal security breaches, User account and service hijacking, measures to reduce cloud security breaches

Case Studies: Comparison of existing Cloud platforms /Web Services.

**[6hrs] (CO5)**

**Course Outcomes:**

After undergoing this course, the students will be able to:

CO1: Understand the core concepts of the cloud computing paradigm

CO2: Understanding importance of virtualization along with their technologies

CO3: Analyze various cloud computing service and deployment models and apply them to solve

problems on the cloud.

CO4: Implementation of various security strategies for different cloud platform

**Suggested Readings/ Books:**

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, "Cloud Computing: Principles and Paradigms",Wiley 2011
2. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, "Cloud Computing: A practical Approach", McGraw Hill, 2010.
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2011.
4. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, "Cloud Computing for dummies", 2009.

Reference Books

1. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing" TMH 2013.
2. George Reese "Cloud Application Architectures", First Edition, O"Reilly Media 2009.
3. Dr. Kumar Saurabh "Cloud Computing" 2nd Edition, Wiley India 2012.

<b>Course Code: BTIT 621-18</b>	<b>Course Title: Cloud Computing Lab</b>	<b>L:0;T:0; P:2</b>	<b>Credits</b>
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**Detailed List of Tasks:**

- 1a. Install VirtualBox/VMware Workstation on different OS.
- 1b. Install different operating systems in VMware.
2. Simulate a cloud scenario using simulator.
3. Implement scheduling algorithms.
4. To study cloud security management.

5.To study and implementation of identity management

6.Case Study - Amazon Web Services/Microsoft Azure/Google cloud services.

**Suggested Tools –Matlab, Cloudsim**

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# *Seventh Semester*

<b>Course Code:</b> BTIT 701-18	<b>Course Title:</b> Software Testing and Quality Assurance	<b>3L:0T:0P</b>	<b>3Credits</b>	<b>42 Hours</b>
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**Detailed Contents:**

**Module 1:**

Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.

[7hrs] (CO 1)

**Module 2:**

**Testing techniques and levels of testing:**

Using White Box Approach to Test design - Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing - Usability and Accessibility Testing, Configuration Testing, Compatibility Testing

[10hrs] (CO2 )

**Module 3:**

**Automation and Quality Metrics**

Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss Function, Cost of Quality.

[8 hrs] (CO 3)

**Module 4:**

**Quality Assurance tools and Models**

SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.

Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM

[8hrs] (CO4 )

**Module 5:**

**Quality Assurance trends;**

Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their Affect on Software Quality.

[6hrs] (CO5 )

**COURSE Outcomes:** By the end of the course, students should be able to

1. Test the software by applying testing techniques to deliver a product free from bugs.
2. Investigate the scenario and to select the proper testing technique.
3. Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
4. Understand how to detect, classify, prevent and remove defects.
5. Choose appropriate quality assurance models and develop quality.



**Text Books:**

1. Srinivasan Desikan, Gopaldaswamy Ramesh, Software Testing: Principles and Practices Pearson.
2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson Addison Wesley.

**Reference Books:**

3. Aditya P. Mathur, Foundations of Software Testing, Pearson.
4. Paul Ammann, Jeff Offutt, Introduction to Software Testing, Cambridge University Press.
5. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Auerbach Publications.
6. William Perry, Effective Methods of Software Testing, Wiley Publishing, Third Edition.
7. Renu Rajani, Pradeep Oak, Software Testing – Effective Methods, Tools and Techniques, Tata McGraw Hill.

# Elective-IV

Course Code: BTIT702-18	Course Title: Software Project Management	3L:0T:0P	3 Credits
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## Detailed Contents:

### MODULE 1: Introduction

Project Evaluation and Planning - Activities in Software Project Management, Overview of Project Planning, Stepwise planning, contract management, Software processes and process models.

[5hrs] (CO1)

### MODULE 2: Cost Benefit Analysis

Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation. Project costing, COCOMO 2, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb.

[6hrs] (CO2)

### MODULE 3: Project Scheduling

Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Hazard Identification, Hazard Analysis, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

[8hrs] (CO3)

### MODULE 4: Monitoring & Control

Monitoring and Control- Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control, Software Configuration Management (SCM), Managing Contracts, Types of Contracts, Stages in Contract Placement, Typical Terms of a Contract, Contract Management and Acceptance.

[8hrs] (CO4)

### MODULE 5: Quality Management

Quality Management and People Management- Introduction, Understanding Behavior, Organizational Behavior, Selecting the Right Person for The Job, Motivation, The Oldman – Hackman Job Characteristics Model, Working in Groups, Organization and team structures, Decision Making, Leadership, Organizational Structures, Stress, Health and Safety. ISO and CMMI models, Testing, and Software reliability, test automation, Overview of project management tools.

[9hrs] (CO5)

## Course Outcomes:

After undergoing this course, the students will be able to:

- CO1: Explain project management in terms of the software development process
- CO2: Estimate project cost and perform cost-benefit evaluation among projects
- CO3: Apply the concepts of project scheduling and risk management.
- CO4: Explain Software configuration management and the concepts of contract management.
- CO5: Apply quality models in software projects for maintaining software quality and reliability

## Suggested Readings/Books:

1. Bob Hughes, Mike Cotterell, "Software Project Management", Tata McGraw Hill. (2009)
2. Royce, "Software Project Management", Pearson Education. (2005).
3. Robert K. Wysocki, "Effective Software Project Management", Wiley. (2006)

**IK Gujral Punjab Technical University, Kapurthala**  
**B. Tech, Information Technology**

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4. Ian Sommerville, Software Engineering, Seventh Edition, Pearson Education.
  5. R.S. Pressman, Software Engineering: A Practitioner's Approach, Sixth Edition, Tata McGraw-Hill.
  6. Kassem, Software Engineering, Cengage Learning
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<b>Course Code: BTIT710-18</b>	<b>Course Title: Software Project Management Lab</b>	<b>L:0;T:0; P:2</b>	<b>1 Credits</b>
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**Detailed List of Tasks:**

**Task 1:** Introduction to MS Project

**Task 2:** Create a Project Plan

- Specify project name and start (or finish) date.
- Identify and define project tasks.
- Define duration for each project task.
- Define milestones in the plan
- Define dependency between tasks

**Task 3:** Create Project Plan contd.

- Define project calendar.
- Define project resources.
- Specify resource type and resource rates
- Assign resources against each task
- Baseline the project plan

**Task 4:** Execute and Monitor the Project Plan

- Update % Complete with current task status.
- Review the status of each task.
- Compare Planned vs Actual Status
- Review the status of Critical Path
- Review resources assignation status

**Task 5:** Generate Dashboard and Reports

- Dashboard
- Resource Reports
- Cost Reports
- Progress Reports

**Suggested Tools** – MS Project, Rational Team Concert

**Course Outcomes:**

After undergoing this course, the students will be able to:

**IK Gujral Punjab Technical University, Kapurthala**  
**B. Tech, Information Technology**

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CO1: Plan and manage projects.

CO2: Consolidate and communicate information about their project.

CO3: Create Gantt charts and PERT (Project Evaluation Review Technique) chart of their project

CO4: Manage resources, assignments, work allocation and generate reports to assess project status, project cost status and resource utilization.

CO5: Identify factors affecting the critical path of their project.

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<b>Course Code: BTIT703-18</b>	<b>Course Title: Distributed Operating System</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Prerequisite of course:** Operating System, Computer Network.

**Detailed Contents:**

**MODULE 1:**

CO1

Introduction of Distributed Operating System (DOS), Functions of DOS, Basic concepts, goals & challenges of distributed systems, architectures of DOS. Revisit the inter process communication.

Communication in DOS: Study of case studies for distributed environment, Issues in communication, message-oriented communication, remote procedure call, remote method invocation, stream-oriented communication, communication between processes, unstructured Vs structured communication, blocking Vs non-blocking communication

**MODULE 2:**

CO2, CO3

Transaction and Concurrency Control: Basic concurrency control mechanism in DOS mutual exclusion in distributed environment, Transactions and Concurrency Control in distributed environment, distributed deadlocks in distributed environment.

**MODULE 3:**

CO3, CO4

Distributed and Shared Memory Management(DSM): Basic fundamentals of shared memory in DOS, Architecture and algorithm of distributed shared memory, advantages & challenges of DSM, Memory coherence, consistency model, consistency with uniprocessor system, consistency with multiprocessing environment.

Resource Management in DOS: Types of resources, issues of resource sharing, Task assignment, Types of distributed load balancing algorithms, load estimation policy, process transfer, location policy, state information exchange policy, priority assignment policy, process migration.

**MODULE 4:**

CO 4, CO 5

Security in DOS: Importance of security, Types of external attacks, Basic elements of Information System security and policy, Trust Management, Access control models, cryptography.

**Text Books:**

1. Andrew S. Tanenbaum & Maarten van Steen, Distributed Systems: Principles and Paradigms, Prentice-Hall(2002) ISBN0-13-088893-1

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2. D. L. Galli, Distributed Operating Systems, Prentice-Hall(2000) ISBN0-13-079843-6
3. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International
4. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
5. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley

**Course Outcomes:** After the completion of this course, student will be able to:

- CO1: Acquire knowledge of distributed operating system architecture
- CO2: Illustrate principles and importance of distributed operating system
- CO3: Implement distributed client server applications using remote method invocation
- CO4: Distinguish between centralized systems and distributed systems
- CO5: Create stateful and state-less applications

<b>Course Code: BTIT711-18</b>	<b>Course Title: Distributed Operating System Lab</b>	<b>L:0;T:0; P:2</b>	<b>1 Credits</b>
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**List of Experiments:**

1. Concurrent client server application demo program to implement.
2. Remote procedure call program needs to implement.
3. Remote Method Invocation implementation.
4. Thread Programming in any application using JAVA.
5. Program counter management in shared memory.
6. Learning of RPCGEN interface.
7. Basic calculator program to understand RPCGEN.
8. Find a length of given string as an input of a RPCGEN utility.
9. Temperature conversation using RPCGEN.
10. Basic calculator program using RMI.
11. Implementation of state-full and stateless server.

**Supplementary Resources:**

1. <http://nptel.ac.in/syllabus/106106107/>

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<b>Course Code: BTIT704-18</b>	<b>Course Title: Soft Computing</b>	<b>3L:0T:0P</b>	<b>3Credits</b>
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**Detailed Contents:**

**UNIT 1:**

**Introduction:** What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing

[4hrs]

**UNIT 2:**

**Neural Networks:** What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

[10hrs]

**UNIT 3:**

**Fuzzy Systems:** Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification

**[8 hrs]**

**UNIT 4:**

**Genetic Algorithm:** History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization

**[8 hrs]**

**UNIT 5:**

**Hybrid Systems:** Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems

**[5 hrs]**

**Course Outcomes:**

At the end of the course, the student should be able to:

- Understand various soft computing concepts for practical applications
- Design suitable neural network for real time problems
- Construct fuzzy rules and reasoning to develop decision making and expert system
- Apply the importance of optimization techniques and genetic programming
- Review the various hybrid soft computing techniques and apply in real time problems

**Text Books:**

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, Fuzzy Set Theory: Foundations and Applications Prentice Hall, 1997.
3. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning Pearson Education India, 2013.
4. James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.

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<b>Course Code: BTIT712-18</b>	<b>Course Title: Soft Computing Lab</b>	<b>0L:0T:2P</b>	<b>1 Credits</b>
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**Detailed List of Tasks:**

1. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights
2. Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.
3. Train the auto correlator by given patterns:  $A_1=(-1,1,-1,1)$ ,  $A_2=(1,1,1,-1)$ ,  $A_3=(-1, -1, -1, 1)$ . Test it using patterns:  $A_x=(-1,1,-1,1)$ ,  $A_y=(1,1,1,1)$ ,  $A_z=(-1,-1,-1,-1)$ .
4. Train the hetro correlator using multiple training encoding strategy for given patterns:  $A_1=(000111001)$   $B_1=(010000111)$ ,  $A_2=(111001110)$   $B_2=(100000001)$ ,  $A_3=(110110101)$   $B_3=(101001010)$ . Test it using

pattern A2.

5. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.
6. Solve Greg Viot's fuzzy cruise controller using MATLAB Fuzzy logic toolbox
7. Solve Air Conditioner Controller using MATLAB Fuzzy logic toolbox
8. Implement TSP using GA

### **Suggested Tools - MATLAB**

**Lab Outcomes:** After successful completion of the lab, students can able to:

1. Reveal different applications of these models to solve engineering and other problems.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
3. Apply genetic algorithms to combinatorial optimization problems
4. Effectively use existing software tools to solve real problems using a soft computing approach
5. Evaluate and compare solutions by various soft computing approaches for a given problem.

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<b>Course Code: BTIT705-18</b>	<b>Course Title :</b> Human Computer Interactions	<b>3L:0T:0P</b>	<b>3Credits</b>
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### **Detailed Contents:**

#### **Unit-1: Foundations of HCI**

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

#### **Unit-2: Design & software process**

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

#### **Unit-3: Models and theories**

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

#### **Unit-4: Mobile HCI**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

#### **Unit-5: Web interface design**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

**Books and References:**

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, —Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)

**Course Outcomes:** Upon completion, students will be able to:

- CO1: Analyze Human-Computer Interaction principle and designs in Information Systems.
- CO2: Compare various HCI designs to gain knowledge on user-centric interfaces.
- CO3: Evaluate the Internet sites considering; usability and user appreciation designs.
- CO4: Appraise social websites such as; facebook, linkedin, twitter or others from user-centric and HCI viewpoint.
- CO5: Construct conceptual basis to design HCI that includes: problems, goals, user interaction style, as well as user-centric interface design.
- CO6: Apply Information Systems tools to prototype the end-user design.
- CO7: Develop end-user interfaces incorporating problem solving solutions in HCI.



<b>Course Code: BTIT713-18</b>	<b>Course Title :</b> Human Computer Interactions Lab	<b>0L:0T:2P</b>	<b>1Credits</b>
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**List of Tasks:**

1. Do a survey of existing user interfaces available for the selected topic/area and find out pros and cons of those interfaces.
2. Carry out the case study of user interface building and evaluation tools. Further, students will use one of these tools for implementing the prototype of the interface.
3. User Study- Create roles of various users of the system. Decide the role specific tasks of the selected problem. This can be carried out considering the aspects such as Contextual inquiry and representation- understand current environment, practices, use, and imagine how the interface will be used in the specific context.
4. Perform the task analysis by identifying various tasks objects and actions a user can perform on the interface and recommend appropriate interaction style.
5. GOMS and Keystroke Level Model of Proposed Design- Design and develop GOMS model for the selected problem. Develop 2-3 alternate Keystroke Level Model designs and analyze their time required by different types of users to execute a task using an interface and interaction method.
6. Prototype Designing- Design a prototype of the proposed user interface using any open source prototyping tool.
7. Evaluation of Design- Conduct an evaluation of the prototype developed in assignment 6 and describes a set of improvements to your design based on its user evaluation. Conduct the usability testing of developed interface by peers to find out the following usability measures- Time to learn, Speed of performance, Rate of errors by users, Retention over time, Subjective satisfaction.

**Lab Outcomes:** This module's qualification aims are:

- CO1: Analyze and identify usability issues in User interfaces.
  - CO2: Design user interfaces according to the standards.
  - CO3: Evaluate user interfaces using Heuristic Evaluation and Thinking aloud Test.
  - CO4: Demonstrate skills to collaborate in a team for justifying identified problems and to write interface related reports as per the standards.
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# Elective-V

<b>Course Code: BTIT706-18</b>	<b>Course Title: Data Warehousing and Mining</b>	<b>3L: 0T: 0P</b>	<b>Credits: 3</b>
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## Detailed Contents:

### **UNIT 1:**

**Data Warehousing Introduction:** design guidelines for data warehouse implementation, Multidimensional Models; OLAP- introduction, Characteristics, Architecture, Multidimensional view Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP and data cube, Data cube operations, data cube computation.

**Data mining:** What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity

[10hrs]

### **UNIT 2:**

**Data mining:** Introduction, association rules mining, Naive algorithm, Apriori algorithm, direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent pattern without candidate generation (FP, growth), performance evaluation of algorithms

**Classification:** Introduction, decision tree, tree induction algorithms – split algorithm based on information theory, split algorithm based on Gini index; naïve Bayes method; estimating predictive accuracy of classification method

[10 hrs]

### **UNIT 3:**

**Cluster analysis:** Introduction, partition methods, hierarchical methods, density based methods, dealing with large databases, cluster software

**Search engines:** Characteristics of Search engines, Search Engine Functionality, Search Engine Architecture, Ranking of web pages, The search engine history, Enterprise Search, Enterprise Search Engine Software.

[10 hrs]

### **UNIT 4:**

**Web data mining:** Web Terminology and Characteristics, Locality and Hierarchy in the web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web mining Software.

[8 hrs]

### **Suggested Readings / Books:**

1. Carlo Verellis, Business Intelligence: Data mining and Optimization for Decision Making, WILEY.
2. Han J., Kamber M. and Pei J. , b Data mining concepts and techniques, Morgan Kaufmann Publishers (2011) 3rd ed.
3. Pudi V., Krishana P.R., Data Mining, Oxford University press, (2009) 1st ed.
4. Adriaans P., Zantinge D., Data mining, Pearson education press (1996), 1st ed.
5. Pooniah P. , Data Warehousing Fundamentals, Willey interscience Publication, (2001), 1st ed.

**Course Outcomes:** After successful completion of the course students can able to:

- Understand the functionality of the various data mining and data warehousing component
- Appreciate the strengths and limitations of various data mining and data warehousing models
- Explain the analyzing techniques of various data
- Describe different methodologies used in data mining and data ware housing.
- Compare different approaches of data ware housing and data mining with various technologies.

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<b>Course Code: BTIT714-18</b>	<b>Course Title : Data Warehousing and Mining Lab</b>	<b>0L:0T:2P</b>	<b>1Credits</b>
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**Course outcomes:**

- CO1 Identify different data mining tools used to analyze data.
- CO2 Implement different data mining algorithms to analyze data.
- CO3 Use effective visualization for representing data.

**List of Tasks:**

- 1 Introduction to WEKA and R tools.
- 2 Installation of Weka/ R Tool.
- 3 Introduction to various components of WEKA/ R tool.
- 4 Fundamental programming using WEKA/ R tool.
- 5 Implementing data preprocessing.
- 6 Implementing apriori algorithm.
- 7 Implementing classification using decision tree.
- 8 Implementing classification using decision tree induction.
- 9 Implementation k-mean clustering
- 10 Implementing different Data visualization tools.

- Number of practical's can be more than 10 by implementing these algorithms on different data sets. Also, visualization tools can be used simultaneously to represent the outcomes in a better way

**Reference Books:**

1. Data Mining: Practical Machine Learning Tools and Techniques, 3rd edition by Ian H. Witten, Eibe Frank, Mark A. Hall Published by Morgan Kaufmann.
2. Data analytics using R, 1st edition by Seema Acharya Published by Tata Mcgraw Hill. E Books/

**Online learning material**

Students can refer to youtube channel: Data Mining with Weka (WekaMOOC) by University of WAIKATO for reference using the following link:  
<https://www.youtube.com/user/WekaMOOC>

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<b>Course Code: BTIT707-18</b>	<b>Course Title : Adhoc and Wireless Sensor Networks</b>	<b>L:03, T:0, P: 0</b>	<b>Credits: 3</b>
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**Detailed Contents:**

**UNIT 1:**

**{07hrs}(CO1)**

**ADHOC AND SENSORS NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS:**

Wireless Sensor Networks (WSNs): concepts and architectures - Applications of Ad Hoc and Sensor Networks - Design Challenges in Ad hoc and Sensor Networks. Wireless Networks, Issues in Ad hoc wireless networks, Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

**UNIT2:**

**{09hrs}(CO2)**

**WSN NETWORKING CONCEPT AND MAC PROTOCOLS:**

Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks - Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, MAC Protocols for wireless sensors Networks, Low duty cycle Protocols and Wakeup concepts, Classification of MAC Protocols, S-MAC, Contention based protocols -PAMAS schedule based protocols –LEACH, IEEE 802.15.4. MAC protocols, Energy efficient routing challenges and issues in transport layer

**UNIT 3:**

**{06hrs}(CO3)**

**ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS:**

Routing Protocol: Issues in designing a routing protocol for Ad hoc networks - Classification- proactive routing - reactive routing (on-demand) - hybrid routing - Transport Layer protocol for Ad hoc networks - Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks -Classification of Transport Layer solutions-TCP over Ad hoc wireless,

**UNIT4:**

**{06hrs}(CO4)**

**SENSOR NETWORKS INTRODUCTION AND ARCHITECTURES:**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations.

**UNIT 5:**

**{07hrs}(CO5)**

**SENSOR NETWORK SECURITY- NETWORK SECURITY:**

Security in Ad Hoc Wireless Networks - Network Security Requirements. Network Security requirements issues and Challenges in security provisioning Network, Security Attacks. Layer wise attack in wireless sensor networks, possible solutions for Jamming, tampering black hole attack, Flooding attack, Key distribution and Management, Secure Routing -SPINS reliability requirements in sensors Networks. Sensor Network Platforms and Tools

**Course Outcomes:**

After undergoing this course, the students will be able to:

<b>CO Nos.</b>	<b>Course Outcomes:</b>
<b>CO1</b>	Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks and apply this knowledge to identify the suitable routing algorithm based on the network.
<b>CO2</b>	Apply the knowledge to identify appropriate physical and MAC layer protocols
<b>CO3:</b>	Understand the transport layer and Describe routing protocols for ad hoc wireless networks with respect to TCP design issues
<b>CO 4</b>	Be familiar with the OS used in Wireless Sensor Networks and build basic modules CO 5:
<b>CO 5</b>	Understand the Challenges in security provisioning, Security Attacks and security issues possible in Adhoc and Sensors Networks

**Suggested Readings/ Books:**

**Text Books:**

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Pearson Education, 2008.
2. Labiod. H, "Wireless Adhoc and Sensor Networks", Wiley, 2008.
3. 3. Li, X, "Wireless ad -hoc and sensor Networks: theory and applications", Cambridge University Press, 2008.

### Reference Books

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, world Scientific Publishing Company, 2nd edition, 2011.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005 (soft copy available).
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks Technology, Protocols, and Applications”, John Wiley, 2007. (soft copy available).
5. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003. (soft copy available)

### Online Resources:

1. [www.wirelessnetworksonline.com](http://www.wirelessnetworksonline.com)
2. [www.securityinwireless.com](http://www.securityinwireless.com)
3. [www.ida.liu.se/~petel71/SN/lecture-notes/sn.pdf](http://www.ida.liu.se/~petel71/SN/lecture-notes/sn.pdf) Practice Aspects 1. NS2 Simulator tool

<b>Course Code: BTIT715-18</b>	<b>Course Title : Adhoc and Wireless Sensor Networks Lab</b>	<b>L:0, T:0, P: 2</b>	<b>Credits: 1</b>
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### List of Experiments:

Sr. No	Name and list of Practical
1	Introduction of Wireless sensor network applications and its simulation
2	Network Simulator installation of wireless sensor network.
3	Implementation of routing protocol in NS2 for DSR protocol
4	Study other wireless sensor network simulators (Mannasim. Contiki)
5	Implementation of routing protocol in NS2 for AODV protocol for TORA protocol

### Lab Outcomes:

 By the end of this course, you should be able

1. To understand importance of Microcontroller Programming and assembly programming languages.
  2. To understand about importance of various Interfaces
  3. To understand and develop information dissemination protocols for sensor and Adhoc networks
  4. To develop wireless sensor systems for different applications
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<b>Course Code: BTIT708-18</b>	<b>Course Title: Speech and Natural Language Processing</b>	<b>3L:0 T: 0P</b>	<b>Credits: 3</b>
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**OBJECTIVE:** To tag a given text with basic Language processing features, design an innovative application using NLP components, implement a rule based system to tackle morphology/syntax of a Language, design a tag set to be used for statistical processing keeping an application in mind, design a Statistical technique for a new application, Compare and contrast use of different statistical approaches for different types of applications.

**Detailed Contents:**

**UNIT I INTRODUCTION**

Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues - Applications - The role of machine learning - Probability Basics –Information theory – Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

**UNIT II MORPHOLOGY AND PART OF SPEECH TAGGING**

Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields

**UNIT III SYNTAX PARSING**

Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification -Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs.103

**UNIT IV SEMANTIC ANALYSIS**

Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics[1]Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

**UNIT V APPLICATIONS**

Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering.

**Course Outcomes:** At the end of the course, students will be able to-

1. Describe the fundamental concepts and techniques of natural language processing.
2. Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each.
3. Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.
4. Analyze large volume text data generated from a range of real-world applications.

**Text Books:**

1. Daniel Jurafsky and James H. Martin. 2009. Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics. 2nd edition. Prentice-Hall.
  2. Christopher D. Manning and Hinrich Schütze. 1999. Foundations of Statistical Natural Language Processing. MIT Press.
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<b>Course Code: BTIT716-18</b>	<b>Course Title: Speech and Natural Language Processing Lab</b>	<b>0L:0 T: 2P</b>	<b>Credits: 1</b>
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**Objectives:** To describe the techniques and algorithms used in processing (text and speech) natural languages.

**SECTION-A Introduction:** Motivation for studying NLP; Introduction to NLP, Language Structure and Analyzer - Overview of language, requirement of computational grammar. Natural Language Processing as the forcing function of AI Words and Word Forms: Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields, Scope Ambiguity and Attachment Ambiguity resolution. Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

**SECTION-B Machine Translation:** Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule-Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation, UNL Based Machine Translation, Translation involving Indian Languages. Meaning: Lexical Knowledge Networks, WorldNet Theory; Indian Language Word Nets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors. Speech Recognition: Signal processing and analysis method, Articulation and acoustics, Phonology and phonetic transcription, Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

Reference Books: 1. James A., Natural language Understanding 2e, Pearson Education, 1994 2. Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000 3. Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008 4. Jurafsky, Dab and Martin, James, Speechand Language Processing, Second Edition, Prentice Hall, 2008.

**List of Experiments:**

1. Write a program for word analysis
2. Write a program for word generation
3. Write a program for morphology study
4. Write an program for POS tagging using hidden markov model
5. Write an program for building chunker

**Lab Outcomes:** After successful completion of the lab, students can able to:

1. Apply these mathematical models and algorithms in applications in software design and implementation for NLP.
  2. build a ASR for a given language
  3. build a TTS for a given language
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<b>Course Code: BTIT708-18</b>	<b>Course Title: Network Programming</b>	<b>3L:0 T: 0P</b>	<b>Credits: 3</b>
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**Detailed Contents:**

**Unit- I**

Networking & TCP/IP: Communication protocols, Network architecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures, Programming Applications: Time & date routines, Internet protocols: Application layer, Transport layer, Network layer, Datalink layer protocols, Chat, Email, Web server working method & programming.

**UNIT-II**

Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols.

**UNIT- III**

APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

**UNIT- IV**

Web Programming & Security: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

**UNIT- V**

Client Server Programming: Client side programming: Creating sockets, implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

**Course Outcomes:** By the end of the course, students should be able to:

- Understand the OSI reference model and a variety of network protocols.
- Implement specific network programming constructs on Unix platforms to create robust real-world sockets-based applications.
- Design and implement client/server programs using a variety of protocols and platforms.
- Apply the concepts of the C programming language to the construction of moderately complex software implementation problems.

**TEXT BOOKS:**

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, - W. Richard Stevens. PHI.

**REFERENCES:**

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education



<b>Course Code: BTIT718-18</b>	<b>Course Title: Network Programming Lab</b>	<b>0L:0 T: 2P</b>	<b>Credits: 1</b>
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**List of Experiments:**

1. Write an echo program with client and iterative server using TCP.
2. Write an echo program with client and concurrent server using TCP.
3. Write an echo program with client and concurrent server using UDP.
4. Write a client and server program for chatting.
5. Write a program to retrieve date and time using TCP.
6. Write a program to retrieve date and time using UDP.
7. Write a client and server routines showing Blocking I/O.
8. Write a client and server routines showing I/O multiplexing.
9. Write an echo client and server program using Unix domain stream socket.
10. Write an echo client and server program using Unix domain Datagram socket.
11. Write a client and server program to implement file transfer.
12. Write a client and server program to implement the remote command execution
13. Write a client program that gets a number from the user and sends the number to server for conversion into hexadecimal and gets the result from the server