LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

[LOCF]

Sanskar Sarjan Education Society's

DTSS COLLEGE OF COMMERCE

[AUTONOMOUS]

PROGRAMME CODE: BIT0021

Bachelor of Science in

Information Technology

[B. Sc. I.T.]

PROGRAMME STRUCTURE

1. **Title of the Program** : B.Sc. in Information Technology
2. **Program Code** : BIT0021
3. **Introduction of the Program**

   B.Sc. in IT is a course which is essentially about processing, storing, securing, and managing information. A degree of Bachelor of Science with the specialization in Information Technology usually takes about three to four years to complete.

4. **Program Objectives**

   a. To develop problem solving abilities using a computer.
   b. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
   c. To imbibe quality software development practices to create awareness about process and product standards.
   d. Take on leadership positions and/or embark on a research career in the field.
   e. Collaborate in diverse team environments to make positive contributions in the IT field.
   f. Work effectively in the IT field to make a positive contribution to society.

5. **System : CHOICE BASED CREDIT SYSTEM [CBCS]**
6. **Duration of the Program** : 3 years
7. **Total No of Semesters** : 6
8. **Eligibility for Admission :** An applicant must have a minimum 45% marks aggregate (open) and 40% marks aggregate (for reserved category) (with Mathematics)
9. **Intake capacity :** 60
10. **Total Credits :** 136
11. **Types of Courses:**

	Course Type	Total
a.	Core Courses	18
b.	Elective Courses	4 to be selected out of 8

c. Ability Enhancement Courses	06
d. Skill Knowledge Based Courses	06
e. Multi-disciplinary / inter-disciplinary courses	02
f. Practicals	31
g. Choice Based Project	01

12. Fee Structure :

13. Teacher's Qualification: Post Graduate in Information Technology/Computer Science or Equivalent one from Recognized University, NET /SET or Ph.D.

14. Per week Work-load of the Teacher :

a. Theory : 90 periods per week

b. **Practical : 48** periods per week

15. Total Courses

Semester	Category of Course	No of Courses	Credits Allotted
I	A. Core Courses (Theory)	3	6
	B. Elective Courses (Theory)	-	-
	C. Skill/Ability Enhancement (Theory)	2	4
	D. Inter-Disciplinary (Theory)	1	2
	E. Practical	5	10
II	A. Core Courses (Theory)	3	6
	B. Elective Courses (Theory)	-	-
	C. Skill/Ability Enhancement (Theory)	2	4
	D. Inter-Disciplinary (Theory)	1	2
	E. Practical	5	10
III	A. Core Courses (Theory)	3	6
	B. Elective Courses (Theory)	1	2
	C. Skill/Ability Enhancement (Theory)	2	4

	D. Inter-Disciplinary (Theory) E. Practical	- 5	- 10
IV	A. Core Courses (Theory) B. Elective Courses (Theory) C. Skill/Ability Enhancement (Theory) D. Inter-Disciplinary (Theory) E. Practical	3 1 2 - 5	6 2 4 - 10
V	A. Core Courses (Theory) B. Elective Courses (Theory) C. Skill/Ability Enhancement (Theory) D. Inter-Disciplinary (Theory) E. Practical / Project	3 1 2 - 6	6 2 4 - 12
VI	A. Core Courses (Theory) B. Elective Courses (Theory) C. Skill/Ability Enhancement (Theory) D. Inter-Disciplinary (Theory) E. Practical F. Project (Choice based)	3 1 2 - 5 1	6 2 4 - 10 2
		Total	136

16. Evaluation Pattern _____

a. Total Marks : 5250

Sem-I	Sem-II	Sem-III	Sem-IV	Sem-V	Sem-VI	Total
850	850	850	850	900	950	5250

b. Passing Criteria :40% in theory as well as in practical.

c. Marking Scheme 60:40

d. Mode of Evaluation of Answer-book : Offline

e. Paper Pattern

[A]	Evaluation scheme for Theory courses	Marks
	I. Continuous Assessment (C.A.) **1 C.A.-I : Test – 20 Marks of 40 mins. duration** **2 C.A.-II : Assignment/Presentation/Project -15 Marks** **Active Participation/Attendance -05 Marks**	**40 Marks**
	II. Semester End Examination (SEE)	**60 Marks**
Q. 1	**Objective/Short Answer (Covering the whole Syllabus)**	**10 Marks**
Q. 2	**Answer any two Descriptive**	**10 Marks**
Q. 3	**Answer any two Descriptive**	**10 Marks**
Q. 4	**Answer any two Descriptive**	**10 Marks**
Q. 5	**Answer any two Descriptive**	**10 Marks**
Q. 6	**Answer any two Descriptive**	**10 Marks**
[B]	**Evaluation scheme for Practical courses**	**50 Marks**
	Practical: **Internal – 20 marks [Journal -10 + Viva 10]** **External – 30 marks [Practical Output]**	

17. Programme Outcome

Upon completion of the B. Sc. Information Technology programme, learner will be able to:

PO1: Develop knowledge of scientific theories and methods, gain experience in working independently with scientific questions and their ability to express clearly on academic issues keeping in view legal, ethical, social security and issues.

PO2: Communicate effectively in written and oral context with specialized and non-specialized audiences.

PO3: Identify information technology related problems, analyze them and design the system or provide the solution for the problem.

PO4: Apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies.

PO5: Function in multidisciplinary teams by working cooperatively, creatively and responsibly as a member of a team.

Semester - I

Semester - I				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC101	**Core Subject**	**Modern Operating Systems**	**2**	**100**
BITCC102	**Core Subject**	**Discrete Mathematics and Probability**	**2**	**100**
BITCC103	**Core Subject**	**Digital Logic and Design**	**2**	**100**
BITSB104	**Skill Based**	**Structural Programming**	**2**	**100**
BITAE105	**Ability Enhancement**	**Introduction to Database Management System**	**2**	**100**
BITID106	**Inter-disciplinary**	**Green Computing**	**2**	**100**
BITCCP101	**Core Subject Practical**	**Modern Operating Systems Practical**	**2**	**50**
BITCCP102	**Core Subject**	**Discrete Mathematics and Probability Practical**	**2**	**50**
BITCCP103	**Core Subject**	**Digital Logic and Design Practical**	**2**	**50**
BITSBP104	**Skill Based**	**Structural Programming Practical**	**2**	**50**
BITAEP105	**Ability Enhancement**	**Introduction to Database Management System Practical**	**2**	**50**
BITIDP106	**Inter-disciplinary**	**-**	**-**	**-**
		Total Credits	**22**	**850**

COURSE DETAILS

1) Title of the Course: Modern Operating System

2) Course Code: For Theory :BITCC101
For Practical: BITCCP101

3) Course Objective:

1. To understand the basic Operating System concepts and founding the services and advantages of it.
2. Importance of virtualization and cloud computing in today's IT industries.
3. Learning the features of different Operating System like Linux, Windows, and Android etc.
4. Understand how Operating system manage the File and Directory system.
5. Gaining the knowledge about Scheduling algorithm.

4) **Category of Course :**Core Course

5) **Semester :**I

6) **Total Hours:**60 lectures

7) **Total Credits:**04 Credits (02 Credits for Theory & 02 Credits for Practical)

8) **Modules:-**

Course Code	**Course Name**	**Teaching Scheme (Hours /Week)**		**Credits Assigned**		
		Theory	**Practical/ Tutorial**	**Theory**	**Practical/ Tutorial**	**Total**
BITCC101	Operating System	5	3	2	2	4

Unit	Details	Lectures
I	**Introduction:** What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure. **Processes and Threads:** Processes, threads, interprocess communication, scheduling, IPC problems.	**12**
II	**Memory Management:** No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation. **File Systems:** Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system.	**12**
III	**Input-Output:** Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management, **Deadlocks:** Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues.	**12**
IV	**Virtualization and Cloud:** History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems** Multiprocessors, multicomputer, distributed systems.	**12**

V	**Case Study on LINUX and ANDROID:** History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, I/O in Linux, Linux file system, security in Linux. Android **Case Study on Windows:** History of windows through Windows 10, programming windows, system structure, processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows.	**12**
	Total	**60**

Practical List :-

List of Practical	
1.	Installation of virtual machine software.
2.	Installation of Linux operating system(Red Hat /Ubuntu) on virtual machine.
3.	Installation of Windows operating system on virtual machine.
4.	**Linux commands:Workingwith Directories:**
a.	pwd, cd,absolute and relative paths, ls, mkdir, rmdir,
b.	file, touch, rm, cp. mv, rename, head, tail, cat, tac, more, less, strings, chmod
5.	**Linux commands: Working with files:**
a.	ps, top, kill, pkill, bg, fg,
b.	grep, locate, find, locate.
c.	date, cal, uptime, w, whoami, finger, uname, man,df, du, free, whereis, which.
d.	Compression:tar,gzip.
6.	**Windows(DOS)Commands – 1**
a.	Date,time, prompt, md, cd,rd, path.
b.	Chkdsk, copy,xcopy,format, fidsk,cls,defrag, del, move.
7.	**Windows(DOS)Commands – 2**
a.	Diskcomp,diskcopy,diskpart, doskey, echo
b.	Edit, fc, find, rename, set, type,ver

8.	**Working with WindowsDesktop and utilities**
a.	Notepad
b.	Wordpad
c.	Paint
d.	Taskbar
e.	Adjustingdisplayresolution
f.	Usingthe browsers
g.	Configuringsimple networking
h.	Creatingusers andshares
9.	**Working withLinuxDesktop andutilities**
a.	Thevi editor.
b.	Graphics
c.	Terminal
d.	Adjusting display resolution
e.	Using the browsers
f.	Configuring simple networking
g.	Creating users and shares
10.	Installing utility software on Linux and Windows

9) Evaluation Pattern:

a. **Total Marks**:150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme**: 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books**: Online/Offline

10) Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical+ Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11) Course Outcome:

Students will be able to:

CO1:-Illustrate the fundamentals of Operating System and its features.

CO2:-Explain the different types and services provided by an Operating System.

CO3:-Comprehend the concepts of Virtualization and Cloud computing.

CO4:-Describe the different scheduling algorithm.

CO5:-Discuss the properties of different Operating System like Linux Windows, Android etc.

CO 6:-Understand and Execute the Linux Commands in brief.

12) References:

1. Modern Operating Systems Andrew S. Tanenbaum, Herbert Bos Pearson 4th 2014

2. Operating Systems –Internals and Design Principles Willaim Stallings Pearson 8th 2009

3. Operating System Concepts Abraham Silberschatz, Peter B.GalvinegGagneWiley 8th

4. Operating Systems Godbole and KahateMcGrawHill 3rd

COURSE STRUCTURE

1. **Title of the Course :** Discrete mathematics and probability
2. **Semester** : I
3. **Course Code: For Theory :** BITCC102
   For Practical: BITCCP102
4. **Course Objective:**

1. Mathematical reasoning: Students are expected to use mathematical reasoning in order to read, comprehend, and construct mathematical arguments. Students will learn basic concepts of mathematical logic and proof.

2. Combinatorial analysis: Students will count or enumerate objects and perform combinatorial analysis.

3. Discrete structures: Students will learn the basic concepts of sets, permutations, relations, graphs, trees and finite state machines. Students will represent discrete objects and relationships using abstract mathematical structures.

4. Algorithmic thinking: Students will verify whether an algorithm works well and perform analysis in terms of memory and time.

5. Applications and modeling: Discrete mathematics has been used in numerous applications. Students will formulate and model problems with the concepts and techniques of discrete mathematics.

5.Category of Course : Core Course

6.Total Hours: 60

7.Total Credits: 04 Credits (02 Credits for Theory & 02 Credits for Practical)

8.Evaluation Pattern:

- **Total Marks** : 150 Marks (10 Point Grading)
- **Passing Criteria** : 40 % (4 Grade Points)
- **Marking Scheme** : 60:40:50 Pattern
  - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
  - 40 Marks - Internal Assessment (Passing = 16 Marks)
  - 50 Marks - Practical Assessment (Passing = 20 Marks)
- **Mode of Evaluation of Answer-books** : Online/Offline

9. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT10	Discrete Mathematics	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** Variables, the Language of Sets, the Language of Relations and Function Set Theory: Definitions and the Element Method of Proof, Properties of Sets, Venn diagram, Cartesian product, the principle of inclusion exclusion, the principle of inclusion exclusion using Venn diagram Disproof, Algebraic Proofs, Boolean Algebras, and Russell's Paradox and the Halting Problem. **The Logic of Compound Statements**: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments	12
2	**Quantified Statements**: Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements **Elementary Number Theory and Methods of Proof**: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms.	12
3	**Sequences, Mathematical Induction, and Recursion:** Sequences, Mathematical Induction, Strong Mathematical Induction and the Well- Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by iteration, Second order linear homogenous recurrence relations with constant coefficients. General Recursive definitions and structural induction. **Functions**: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions,	12

	Cardinality with Applications to Computability	
4	**Relations**: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations **Graphs and Trees**: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs, Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths.	12
5	**Counting and Probability**: Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the **Multiplication Rule, Counting Elements of Disjoint Sets**: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r- Combinations with Repetition Allowed, Probability Axioms and, Conditional Probability, Bayes 'Formula, and Independent Events.	12
	Total	60

Sr. No.	**List of Practical**
1	**Set Theory** a. Inclusion Exclusion principle. b. Power Sets c. Mathematical Induction
2	**Functions and Algorithms** a. Recursively defined functions b. Cardinality c. Polynomial evaluation d. Greatest Common Divisor.
3	**Counting** a. Sum rule principle b. Product rule principle c. Factorial d. Binomial coefficients e. Permutations

	f. Permutations with repetitions g. Combinations h. Combinations with repetitions i. Ordered partitions j. Unordered partitions
4	**Probability Theory** a. Sample space and events b. Finite probability spaces c. Equiprobable spaces d. Addition Principle e. Conditional Probability f. Multiplication theorem for conditional probability g. Independent events h. Repeated trials with two outcomes
5	**Graph Theory** a. Paths and connectivity b. Minimum spanning tree c. Isomorphism
6	**Directed Graphs** a. Adjacency matrix b. Path matrix
7	**Recurrence relations** a. Linear homogeneous recurrence relations with constant coefficients b. Solving linear homogeneous recurrence relations with constant coefficients c. Solving general homogeneous linear recurrence relations
8	**Algebraic Systems** a. Properties of operations b. Roots of polynomials
9	**Properties of integers**

	a. Division algorithm b. Primes c. Euclidean algorithm d. Fundamental theorem of arithmetic e. Congruence relation f. Linear congruence equation 8. Algebraic Systems a. Properties of operations b. Roots of polynomials
10	**Algebraic Systems** a. Properties of operations b. Roots of polynomials 9. Boolean Algebra a. Basic definitions in Boolean Algebra b. Boolean algebra as lattices

10.Evaluation Pattern:

- **Total Marks** : 150 Marks (10 Point Grading)
- **Passing Criteria** : 40 % (4 Grade Points)
- **Marking Scheme** : 60:40:50 Pattern
  - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
  - 40 Marks - Internal Assessment (Passing = 16 Marks)
  - 50 Marks - Practical Assessment (Passing = 20 Marks)
- **Mode of Evaluation of Answer-books** : Online/Offline

11.Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class test of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignments after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

12. Course Outcome:

Students will be able to:

CO1. Write an argument using logical notation and determine if the argument is or is not valid.

CO2. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.

CO3. Understand the basic principles of sets and operations in sets.

CO4. Prove basic set equalities.

CO5. Apply counting principles to determine probabilities.

CO6. Determine when a function is 1-1 and "onto".

CO7. Demonstrate different traversal methods for trees and graphs.

13. References:

1. Discrete Mathematics with Applications BY Sussana S. Epp Cengage Learning 4th 2010

2. Discrete Mathematics, Schaum's Outlines Series BY Seymour Lipschutz, Marc Lipson Tata MCGraw Hill 2007

3. Discrete Mathematics and its Applications BY Kenneth H. Rosen Tata MCGraw Hill

4. Discrete mathematical structures BY B Kolman RC Busby, S Ross PHI

5. Discrete structures BY Liu Tata MCGraw Hill

COURSE STRUCTURE

1. **Title of the Course:** Digital Logic and Design
2. **Semester**: I
3. **Course Code: For Theory:** BITCC103
   For Practical: BITCCP103
4. **Course Objective:**
   a. To learn Boolean algebra and simplification of Boolean functions.
   b. To learn to design and analyse different combinational circuits.
   c. To study the basics of synchronous sequential logic, analyse and design sequential circuits.
   d. To learn about basic memory devices and programmable logic devices to build simple digital systems.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC103	Microprocessor Architecture & Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Number System:** Analog System, digital system, numbering system, Binary number system, Octal number system, Hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes – ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection and correction, Universal Product Code, Code conversion. **Binary Arithmetic:** Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic.	12
2	**Boolean Algebra and Logic Gates:** Introduction, Logic (AND	12

	OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level. **Minterm, Maxterm and Karnaugh Maps:** Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression.	
3	**Combinational Logic Circuits:** Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations **Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess-3 Adder, Binary Subtractor, BCD Subtractor, Multiplier, Comparator.	12
4	**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:** Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders. **Sequential Circuits:** Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop, conversion from one type of flip-flop to another, Application of flip-flops.	12
5	**Counters:** Introduction, Asynchronous counter, Terms related to counters, IC7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492 Synchronous counter ICs, Analysis of counter circuits. **Shift Register:** Introduction, parallel and shift registers, serial shifting, serial–in serial–out, serial–in parallel–out, parallel–in parallel–out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters.	12
	Total	60

Sr. No.	List of Practical
1.	**Study of Logic gates and their ICs and universal gates:** a. Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates b. IC 7400, 7402, 7404, 7408, 7432, 7486, 74266 c. Implement AND, OR, NOT, XOR, XNOR using NAND gates. d. Implement AND, OR, NOT, XOR, XNOR using NOR gates.
2.	**Implement the given Boolean expressions using minimum number of gates**

	a. Verifying De Morgan's laws. b. Implement other given expressions using minimum number of gates. c. Implement other given expressions using minimum number of ICs.
3.	**Implement combinational circuits** a. Design and implement combinational circuit based on the problem given and minimizing using K-maps.
4.	**Implement code converters** a. Design and implement Binary – to – Gray code converter. b. Design and implement Gray – to – Binary code converter. c. Design and implement Binary – to – BCD code converter. d. Design and implement Binary – to – XS-3 code converter.
5.	**Implement Adder and Subtractor Arithmetic circuits** a. Design and implement Half adder and Full adder. b. Design and implement BCD adder. c. Design and implement XS – 3 adder. d. Design and implement binary subtractor. e. Design and implement BCD subtractor. f. Design and implement XS – 3 subtractor.
6.	**Implement Arithmetic circuits** a. Design and implement a 2-bit by 2-bit multiplier. b. Design and implement a 2-bit comparator.
7.	**Implement Encode and Decoder and Multiplexer and Demultiplexers** a. Design and implement 8:3 encoder. b. Design and implement 3:8 decoder. c. Design and implement 4:1 multiplexer. Study of IC 74153, 74157. d. Design and implement 1:4 demultiplexer. Study of IC 74139. e. Implement the given expression using IC 74151 8:1 multiplexer. f. Implement the given expression using IC 74138 3:8 decoder.
8.	**Study of flip-flops and counters** a. Study of IC 7473. b. Study of IC 7474. c. Study of IC 7476. d. Conversion of Flip-flops. e. Design of 3-bit synchronous counter using 7473 and required gates. f. Design of 3-bit ripple counter using IC 7473.
9.	**Study of counter ICs and designing Mod-N counters** a. Study of IC 7490, 7492, 7493 and designing mod-n counters using these. b. Designing mod-n counters using IC 7473 and 7400 (NAND gates)
10.	**Design of shift registers and shift register counters**

	a. Design serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out and bidirectional shift registers using IC 7474. b. Study of IC 7495. c. Implementation of digits using seven segment displays.

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination:

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. Semester End Practical Examination:

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

On completion of the course, the students will be able to:

CO1: Simplify complex Boolean functions.

CO2: Implement digital circuits using combinational logic ICs and PLDs.

CO3: Understand the characteristics of various Flip-Flops.

CO4: Design digital circuits with combinational and sequential components.

CO5: Analyse digital system designs.

12. **References:**

1. Modern Digital Electronics by R. P. Jain, 4th Edition, Tata McGraw Hill, 2009.
2. Digital Principles and Applications by Malvino and Leach, 8th Edition, Tata McGraw Hill, 2014.
3. Digital Electronics: Principles, Devices and Applications by Anil K. Maini, Wiley, 2007.
4. Make Electronics by Charles Platt, 2nd Edition, Shroff/O'Reilly, 2015.

COURSE STRUCTURE

1. **Title of the Course :** Structural Programming
2. **Semester**: I
3. **Course Code: For Theory :** BITSB104
   For Practical: BITSBP104
4. **Course Objective:**

   1. To learn the fundamental programming concepts and methodologies which are essential to building good C programs.
   2. To practice the fundamental programming methodologies in the C programming language via laboratory experiences. Microsoft Visual Studio is the programming environment that will used.
   3. To code, document, test, and implement a well-structured, robust computer program using the C programming language.
   4. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future
   5. To write reusable modules (collections of functions).
   6. The course is designed to provide complete knowledge of C language.
5. **Category of Course** : Skill Based
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT104	Structural Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** Types of Programming languages, History, features and application. Simple program logic, program development cycle, pseudocode statements and flowchart symbols, sentinel value to end a program, programming and user environments, evolution of programming models., desirable program characteristics. **Fundamentals:** Structure of a program. Compilation and Execution of a Program, Character Set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Variable definition, symbolic constant.	12
2	**Operators and Expressions:** Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions. **Data Input and output:** Single character input and output, entering input data, scanf function, printf function, gets and puts functions, interactive programming.	12

3	**Conditional Statements and Loops:** Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement. **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: foo1lal parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value.	12
4	**Program structure:** Storage classes, automatic variables, external variables, static variables, multifile programs, more library functions, **Preprocessor:** Features, #define and #include, Directives and Macros **Arrays:** Definition, processing, passing arrays to functions, multidimensional arrays, arrays and string.	12
5	**Strings and Structures** : strcmp, strcat, strlen, strcpy, strchr, strrev, strcmpi, strlwr, strupr **Structures**:Introduction to Structures Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, pointer definition.	12
	Total	60

Sr. No.	List of Practical
1	Write a program to find the addition, subtraction, multiplication and division of two numbers
2	Write a program to swap two numbers without using third variable.
3	Write a program to find the area of rectangle, square and circle.
4	Write a program to check whether the number is even or odd.
5	Write a program to find the factorial of a number.
6	Write a program to check whether the entered number is prime or not.
7	Write a program to find the sum of squares of digits of a number.
8	Write a programs to print the Fibonacci series.
9	Write a program to find whether a given number is palindrome or not.
10	Write a program to find the factorial of a number using recursive function..
11	Write a program to find the largest value that is stored in the array.

12	Write a program to demonstrate the use of pointers.
13	Programs on structures.

9. **Evaluation Pattern:**

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**

a. **Internal Assessment:**

● Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.

● Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	**Description**	**Marks**
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10

3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to develop application
CO1: To describe the advantages of a high level language like C/C++, the programming process and the compilation process
CO2: To describe and use software tools in the programming process(IDE)
CO3: To apply good programming principles to the design and implementation of C programs
CO4: To design, implement, debug and test programs using the fundamental elements of C.
CO5: 5: To demonstrate an understanding of primitive data types, values, operators and expressions in C

12. **References:**

1. Programming with C Byron Gottfried Tata McGRAW Hill 2nd 1996
2. Programming Logic and Design Joyce Farell Cengage Learning 8th 2014
3. "C" Programming" Brian W. Kernighan and Denis M. Ritchie. PHI 2nd
4. Let us C Yashwant P. Kanetkar, BPB publication
5. C for beginners Madhusudan Mothe X-Team Series 1st 2008
6. 21st Century C Ben Klemens OReilly 1st 2012

COURSE STRUCTURE

1. **Title of the Course :** Introduction to Database Management System
2. **Semester** : I
3. **Course Code: For Theory:** BITAE105
   For Practical: BITPAE105
4. **Course Objective:**
   a. To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
   b. To understand the different issues involved in the design and implementation of a database system.
   c. To study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
   d. To understand and use data manipulation language to query, update, and manage a database.
   e. To develop an understanding of essential DBMS concepts such as: database security, integrity and concurrency.
   f. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.
5. **Category of Course** : Ability Enhancement
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT105	Introduction to Database Management System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to Databases**:-What is database system, purpose of database system, view of data, relational databases, database architecture and different types of databases. **Data Models: -** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees	12

	of data abstraction.	
2	**Database design and ER Model:-**overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, Enhanced Entity Relationship (EER) modelling, Specialization and Generalization, weak entity sets, Codd's rules, Relational Schemas. **Relational database model: -** Logical view of data, keys, integrity rules. **Relational Database design: -** features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).	12
3	**Relational Algebra and Calculus:-** **Relational algebra:** introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. **Calculus:** Tuple relational calculus, Domain relational Calculus, calculus vs. algebra.	12
4	**Constraints, Views and SQL** **Constraints**:-What are constraints, types, Integrity constraints. **Views:-** Introduction to views, data independence, security, updates on views, comparison between tables and views **SQL:-**data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	12
5	**Transaction management and Concurrency control:** What is transaction, ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods and Database recovery management.	12
	Total	60

Sr. No.	**List of Practical**
1	Design a Database and create required tables. For e.g. Bank, College Database
2	Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3	Write a SQL statement for implementing ALTER,UPDATE and DELETE
4	Write the queries to implement the joins.
5	Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT()
6	Write the query to implement the concept of Integrity constrains
7	Write the query to create the views.
8	Perform the queries for triggers.
9	Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
10	Write the query for creating the users and their role.

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**
   a. **Internal Assessment:**
      - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
      - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

   b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

   c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to:

CO1: Describe the fundamental elements of relational database management systems. Improve the database design by normalization.

CO2: Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO3: Design ER-models to represent simple database application scenarios

CO4: Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO5: Develop an understanding of the differences between OODBMS, ORDBMS and RDBMS and the practical implications of each approach.

CO6: Analyse, design and develop a real database application using DBMS.

12. References:

1. Database System and Concepts By Abraham Silberschatz and Henry Korth and S. Sudarshan , 6th Edition, McGraw-Hill, 2011
2. Database System- Design, Implementation and Management by Peter Rob and Carlos Coronel , 7th Edition , Cengage Learning , 2007
3. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2003
4. Fundaments of Database System by Ramez Elmasri and Shamkant B. Navathe, 7th Edition, Pearson Education India, 2010

COURSE DETAILS

1. Title of the Course : Green Computing
2. Course Code: For Theory : BITID106
   For Practical : BITIDP106

3. Course Objective:

1. To understand how to reduce the use of hazardous materials, maximize energy efficiency during the product life time.
2. Importance of recycling, biodegradability of defunct products and factory waste.
Changing the way of work with GREEN in mind

4. Category of Course : Inter-disciplinary
5. Semester : I
6. Total Hours:60 lectures
7. Total Credits:04 Credits (02 Credits for Theory & 02 Credits for Practical/Project)
8. Modules:-

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITID106	Green Computing	5	3	2	2	4

Unit	Details	Lectures
I	**Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.	**12**
II	**Minimizing Power Usage:** Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, Low-	**12**

	Power Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software. Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together.	
III	**Changing the Way of Work:** Old Behaviours, starting at the Top, Process Reengineering with Green in Mind, Analysing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource. **Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.	**12**
IV	**Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online **Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice	**12**

V	**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling. **Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations.	**12**
	Total	**60**

Practical/ProjectList:

Project and Viva Voce	
1.	A project should be done based on the objectives of Green Computing. A report of minimum 50 pages should be prepared. The report should have a font size of 12, Times new roman and 1.5 line spacing. The headings should have font size 14. The report should be hard bound.
2.	The project can be done individually or a group of two students.
3.	The students will have to present the project during the examination.
4.	A certified copy of the project report is essential to appear for the examination.

9. Evaluation Pattern:

a. Total Marks : 150 Marks (10 Point Grading)

b. Passing Criteria : 40 % (4 Grade Points)

c. Marking Scheme : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Project Assessment (Passing = 20 Marks)

d. Mode of Evaluation of Answer-books : Online/Offline

10. Paper Pattern:

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination :

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Project Submission:** Total Marks:-50

11. Course Outcome :

CO1:- Practice of environmentally sustainable production practices, energy efficient computers.
CO2:- Understand the importance of energy efficiency, power consumption and other way is making green software to thrive the industry and make innovatory products.
CO3:- Comprehend the concepts of Recycling like water recycling.

12. References:

1. Green IT Toby Velte,Anthony Velte,Robert ElsenpeterMcGrawHill2008
2. Green Data Center: Stepsfor the JourneyAlvinGalea, Michael Schaefer, Mike EbbersShroffPublishersandDistributers2011
3. Green Computing andGreen IT Best PracticeJason Harris Emereo
4. Green Computing Tools and Techniques forSaving Energy, Money
And ResourcesBud E. Smith CRC Press 2014

Semester - II

Semester - II				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC201	**Core Subject**	**Numerical Analysis and Statistical technique**	**2**	**100**
BITCC202	**Core Subject**	**Advance Scripting Languages**	**2**	**100**
BITCC203	**Core Subject**	**Microprocessor and microcontroller**	**2**	**100**
BITSB204	**Skill Based**	**OOPs using C++**	**2**	**100**
BITAE205	**Ability Enhancement**	**Communication Skills**	**2**	**100**
BITID206	**Inter-disciplinary**	**Cyber Law**	**2**	**100**
BITCCP201	**Core Subject Practical**	**Numerical Analysis and Statistical technique Practical**	**2**	**50**
BITCCP202	**Core Subject**	**Advance Scripting Languages Practical**	**2**	**50**
BITCCP203	**Core Subject**	**Microprocessor and microcontroller Practical**	**2**	**50**
BITSBP204	**Skill Based**	**OOPs using C++ Practical**	**2**	**50**
BITAEP205	**Ability Enhancement**	**Communication Skills Practical**	**2**	**50**
BITIDP206	**Inter-disciplinary**	**-**	**-**	**-**
		Total Credits	**22**	**850**

COURSE STRUCTURE

1. Title of the Course : Numerical Methods and Statistics

2. Semester : II

3. Course Code: For Theory : BITCC201
For Practical: BITCCP201

4. Course Objective:

1. The main objective of this course is to understand and implement various concepts of numerical analysis and statistics to solve real life problems.

2. Analysis of Statistical Data: Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion.

3.Random Variables and probability distributions: Basic concepts of probability and its properties; Additive and multiplicative theorem of probability; Conditional probability and independent events; Random variable, Notion of sample space; distribution functions; Mathematical expectation, Binomial, Poisson, Rectangular, Exponential and Normal distributions. Random Number Generation: Basic concepts in random number generation;

4. Method for generating random numbers and their efficiency test; Methods for generating random numbers for probability distributions.

5. Floating-Point Numbers: Floating-point representation; Rounding, Chopping; Error analysis; Condition and Instability.

6. Non-Linear Equations: Bisection, Secant, Fixed-point iteration and Newton - Raphson methods; Order of convergence.

7. Linear Systems of equations: Gauss Elimination and LU- decomposition methods; Jacobi and GaussSeidel methods.

8. Interpolation: Newton form of polynomials; Finite differences, Newton's Forward, Lagrange and Newton's divided difference interpolation formula with error analysis; Introduction to Spline. Principle of least Square: Curve fitting; correlation and regression coefficients (two variables only); Rank correlation.

9.Laboratory Work: Implementation of statistical and numerical techniques using C/C++ including Program to obtain frequency charts for large data set and fitting a distribution; Generation of Random Numbers for some distributions; Hypothesis of Testing; Solution of equation using Bisection and Newton-Raphson methods; Solve system of linear equations using Gass elimination and Gauss-Seidel methods; Interpolation by Lagrange and Newton's divided difference methods; Regression analysis using least square approximation; Correlation analysis.

5. Category of Course : Core Course
6. Total Hours: 60
7. Total Credits: 04 Credits (02 Credits for Theory & 02 Credits for Practical)

8. Modules:

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT0	Numerical Methods and Statistics	5	3	2	2	4

Module	Detailed Content	Hours
1	**Mathematical Modeling and Engineering Problem Solving**: A Simple Mathematical Model, Conservation Laws and Engineering **Problems Approximations and Round-Off Errors:** Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors	12
2	**Solutions of Algebraic and Transcendental Equations:** The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. **Interpolation:** Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation	12
3	**Solution of simultaneous algebraic equations (linear) using Iterative methods:** Gauss-Jordan Method, Gauss-Seidel Method. **Numerical differentiation and Integration:** Numerical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules. **Numerical solution of 1st and 2nd order differential equations:** Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2nd Order Differential Equations.	12
4	**Least-Squares Regression:** Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression **Linear Programming**: Linear optimization problem, Formulation and Graphical solution, Basic solution and feasible solution.	12
5	**Random variables:** Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance. **Distributions**: Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications.	12
	Total	60

Sr. No.	List of Practical
1	**Iterative Calculation:** a. Program for iterative calculation. b. Program to calculate the roots of a quadratic equation using the formula. c. Program to evaluate e x using infinite series.
2	**Solution of algebraic and transcendental equations:** a. Program to solve algebraic and transcendental equation by bisection method. b. Program to solve algebraic and transcendental equation by false position method. c. Program to solve algebraic and transcendental equation by Secant method. d. Program to solve algebraic and transcendental equation by Newton Raphson method.
3	**Interpolation** a. Program for Newton's forward interpolation. b. Program for Newton's backward interpolation. c. Program for Lagrange's interpolation.
4	**Solving linear system of equations by iterative methods** a. Program for solving linear system of equations using Gauss Jordan method. b. Program for solving linear system of equations using Gauss Seidel method.
5	**Numerical Differentiation** a. Programing to obtain derivatives numerically.
6	**Numerical Integration** a. Program for numerical integration using Trapezoidal rule. b. Program for numerical integration using Simpson's $1/3^{rd}$ rule. c. Program for numerical integration using Simpson's $3/8^{th}$ rule.
7	**Solution of differential equations** a. Program to solve differential equation using Euler's method b. Program to solve differential equation using modified Euler's method. c. Program to solve differential equation using Runge-kutta 2nd order and 4th order methods**.**
8	**Regression** a. Program for Linear regression. b. Program for Polynomial Regression c. Program for multiple linear regression. d. Program for non-linear regression
9	**Random variables and distributions** a. Program to generate random variables. b. Program to fit binomial distribution. c. Program to fit Poisson distribution.
10	**Distributions** a. Program for Uniform distribution. b. Program for Bernoulli distribution c. Program for Negative binomial distribution.

9. Evaluation Pattern:

a. Total Marks : 150 Marks (10 Point Grading)

b. Passing Criteria : 40 % (4 Grade Points)

c. Marking Scheme : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. Mode of Evaluation of Answer-books : Online/Offline

10. Paper Pattern:

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination :

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. Semester End Practical Examination:

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Students will be able to:

CO1.Understand the various approaches dealing the data using theory of probability.

CO2.Analyze the different samples of data at different level of significance using various hypothesis testing.

CO4. Develop a framework for estimating and predicting the different sample of data for handling the uncertainties.

CO5. Understand error, source of error and its effect on any numerical computation and also analyzing the efficiency of any numerical algorithm.

CO 6.Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton – Raphson and fixed-point iteration methods.

CO7. Solve system of linear equations numerically using direct and iterative methods

CO8 . Understand the methods to construct interpolating polynomials with practical exposure.

12. References:

1 Introductory Methods of Numerical Methods S. S. Shastri PHI Vol – 2

2. Numerical Methods for Engineers Steven C. Chapra, Raymond P. Canale Tata Mc Graw Hill 6 th 2010

3. Numerical Analysis Richard L. Burden, J. Douglas Faires Cengage Learning 9 th 2011

4. Fundamentals of Mathematical Statistics S. C. Gupta, V. K. Kapoor

5. Elements of Applied Mathematics P.N.Wartikar and J.N.Wartikar A. V. Griha, Pune Volume 1 and 2

COURSE STRUCTURE

1. **Title of the Course :** Advanced Scripting Language
2. **Semester** : II
3. **Course Code: For Theory :** BITCC202
   For Practical: BITCCP202
4. **Course Objective:**

   a. Have understanding of server side scripting with PHP language.
   b. Gain knowledge of client side scripting, validation of forms.
   c. Students will be able to easy design and development of web pages.
   d. Students will be able to write a server side PHP, form data sent from client, process it and store it on database.
   e. Students will be able to write a client side script and server side script called PHP
   f. Create applications by using the concepts of JavaScript and PHP.
   g. To study designing web sites and deploying web sites on web servers

5. **Category of Course** : Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT106	Structural Programming	5	3	2	2	4

Module	**Detailed Content**	**Hours**
1	**Internet:**What is Internet, Browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol	12

2	**HTML5 Page layout and navigation:** Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions. HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.	12

3	**Java Script**: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with. Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp **Document and its associated objects0:** document, Link,Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload	12
4	**PHP:** Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, super global arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems.	12
5	**Advanced PHP and MySQL :** PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP	12

Sr. No	List of Practical
1.	Use of Basic Tags
a.	Design a web page using different text formatting tags.
b.	Design a web page with links to different pages and allow navigation between web pages.
c.	Design a web page demonstrating all Style sheet types
2.	Image maps, Tables, Forms and Media
a.	Design a web page with Imagemaps.
b.	Design a web page demonstrating different semantics
c.	Design a web page with a form that uses all types of controls.
e.	Design a web page embedding with multimedia features.
3.	Java Script
a.	Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.
b.	Design a form and validate all the controls placed on the form using Java Script.
c.	Write a JavaScript program to display all the prime numbers between 1 and 100.
a.	Write a JavaScript program to accept a number from the user and display the sum of its digits.
d.	Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
e.	Write a java script program to design simple calculator.
4.	Control and looping statements and Java Script references
a.	Design a web page demonstrating different conditional statements.
b.	Design a web page demonstrating different looping statements.
c.	Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp).
5.	Basic PHP I
a.	Write a PHP Program to accept a number from the user and print it factorial.
b.	Write a PHP program to accept a number from the user and print whether it is prime or not.
6.	Basic PHP II
a.	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.
7.	String Functions and arrays
a.	Write a PHP program to demonstrate different string functions.
b.	Write a PHP program to create one dimensional array.
8.	PHP and Database

a.	Write a PHP code to create: · Create a database College · Create a table Department (Dname, Dno, Number_Of_faculty)
b.	Design a PHP page for authenticating a user.
9.	Sessions
a.	Write a program to demonstrate use of sessions
10.	Cookies
a.	Write a program to demonstrate use of cookies

9. Evaluation Pattern:

a. Total Marks : 150 Marks (10 Point Grading)

b. Passing Criteria : 40 % (4 Grade Points)

c. Marking Scheme : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. Mode of Evaluation of Answer-books : Online/Offline

10. Paper Pattern:

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination :

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to develop application

CO1: Design web pages.

CO2: Format and validate web pages.

CO3: Students will be able to easy design and development of web pages.
CO4: Design web sites and deploy it on web servers.
CO5: Students will be able to write a client side script and server side script called PHP.

12. **References:**

1. HTML5 Step by Step Faithe Wempen Microsoft Press 2011
2. JavaScript 2.0: The Complete Reference Thomas Powell and Fritz Schneider Tata McGraw Hill 2nd
3. PHP 6 and MySQL Bible Steve Suehring, Tim Converse, Joyce Park Wiley 2009
4. PHP 5.1 for Beginners Ivan Bayross Sharanam Shah, SPD 2013
5. PHP Project for Beginners SharanamShah, Vaishali Shah SPD 2015
6. Murach's PHP and MySQL Joel Murach Ray Harris SPD 2011

COURSE STRUCTURE

1. **Title of the Course:** Microprocessor Architecture & Programming
2. **Semester**: II
3. **Course Code: For Theory:** BITCC203
   For Practical: BITCCP203
4. **Course Objective:**
   a. To study the Standard Intel Architecture 8085.
   b. To gain proficiency in Assembler language.
   c. To gain experience in programming peripheral and I/O devices.
   d. To acquire the background for understanding next-generation CPUs.
   e. To learn concepts associated with interfacing a microprocessor to memory and to I/O devices.
   f. To learn how to control components of a microprocessor-based system through the use of interrupts.
   g. To study about current generation processors.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC203	Microprocessor Architecture & Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Microprocessor, microcomputers, and Assembly Language**: Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications. **Microprocessor Architecture and Microcomputer System:** Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing, Microprocessor-Based System Application. **8085 Microprocessor Architecture and Memory Interface**: Introduction, 8085 Microprocessor unit, 8085-Based	12

	Microcomputer, Memory Interfacing, Interfacing the 8155 Memory Segment, Illustrative Example: Designing Memory for the MCTS Project, Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer	
2	**Interfacing of I/O Devices:** Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits **Introduction to 8085 Assembly Language Programming:** The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program. **Introduction to 8085 Instructions:** Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.	12
3	**Programming Techniques with Additional Instructions**: **Programming Techniques:** Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Instruction Related to Memory, Logic Operations: Rotate, Logics Operations: Compare, Dynamic Debugging. **Counters and Time Delays:** Counters and Time Delays, Illustrative Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs. **Stacks and Sub-Routines:** Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts.	12
4	**Code Conversion, BCD Arithmetic, and 16-Bit Data Operations:** BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD to Seven-Segment-LED Code Conversion, Binary-to-ASCII and ASCII to Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction to Advanced Instructions and Applications, Multiplication, Subtraction with Carry. **Software Development System and Assemblers:** Microprocessors-Based Software Development system, Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers. **Interrupts:** The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.	12
5	**The Pentium and Pentium Pro microprocessors:** Introduction, Special Pentium registers, Memory management, Pentium instructions, Pentium Pro microprocessor, Special Pentium Pro features.	12

	Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, i3, i5 and i7. **SUN SPARC Microprocessor:** Architecture, Register file, data types and instruction format.	
	Total	60

Sr. No.	List of Practical
1.	**Perform the following Operations related to memory locations.** a. Store the data byte 32H into memory location 4000H. b. Exchange the contents of memory locations 2000H and 4000H.
2.	**Simple assembly language programs** a. Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H. b. Subtract two 8-bit numbers. c. Add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H. d. Add the contents of memory locations 40001H and 4001H and place the result in the memory locations 4002Hand 4003H. e. Subtract the 16-bit number in memory locations 4002H and 4003H from the 16-bit number in memory locations 4000H and 4001H. The most significant eight bits of the two numbers are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H. f. Find the l's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H. g. Find the 2's complement of the number stored at memory location 4200H and store the complemented number at memory location 4300H.
3.	**Packing and unpacking operations** a. Pack the two unpacked BCD numbers stored in memory locations 4200H and 4201H and store result in memory location 4300H. Assume the least significant digit is stored at 4200H. b. Two-digit BCD number is stored in memory location 4200H. Unpack the BCD number and store the two digits in memory locations 4300H and 4301H such that memory location 4300H will have lower BCD digit.
4.	**Register Operations** a. Write a program to shift 8-bit data four bits right. Assume that data is in register C. b. Program to shift a 16-bit data 1 bit left. Assume data is in the HL register

	pair. c. Write a set of instructions to alter the contents of flag register in 8085. d. Write a program to count number of l's in the contents of D register and store the count in the B register.
5.	**Multiple memory locations** a. Calculate the sum of series of numbers. The length of the series is in memory location 4200H and the series begins from memory location 4201H. a) Consider the sum to be 8-bit number. So, ignore carries. Store the sum at memory location 4300H. b) Consider the sum to be 16-bit number. Store the sum at memory locations 4300H and 4301H. b. Multiply two 8-bit numbers stored in memory locations 2200H and 2201H by repetitive addition and store the result in memory locations 2300H and 2301H. c. Divide 16-bit number stored in memory locations 2200H and 2201H by the 8-bit number stored at memory location 2202H. Store the quotient in memory locations 2300H and 2301H and remainder in memory locations 2302H and 2303H. d. Find the number of negative elements (most significant bit 1) in a block of data. The length of the block is in memory location 2200H and the block itself begins in memory location 2201H. Store the number of negative elements in memory location 2300H. e. Find the largest number in a block of data. The length of the block is in memory location 2200H and the block itself starts from memory location 2201H. Store the maximum number in memory location 2300H. Assume that the numbers in the block are all 8-bit unsigned binary numbers.
6.	**Calculations with respect to memory locations** a. Write a program to sort given 10 numbers from memory location 2200H in the ascending order. b. Calculate the sum of series of even numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 8-bit number so you can ignore carries and store the sum at memory location 2Sample problem. c. Calculate the sum of series of odd numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 16-bit. Store the sum at memory locations 2300H and 2301H. d. Find the square of the given numbers from memory location 6100H and store the result from memory location 7000H. e. Search the given byte in the list of 50 numbers stored in the consecutive memory locations and store the address of memory location in the memory locations 2200H and 2201H. Assume byte is in the C register

	and starting address of the list is 2000H. If byte is not found store 00 at 2200H and 2201H. f. Two decimal numbers six digits each, are stored in BCD package form. Each number occupies a sequence of byte in the memory. The starting address of first number is 6000H Write an assembly language program that adds these two numbers and stores the sum in the same format starting from memory location 6200H. g. Add 2 arrays having ten 8-bit numbers each and generate a third array of result. It is necessary to add the first element of array 1 with the first element of array-2 and so on. The starting addresses of array l, array2 and array3 are 2200H, 2300H and 2400H respectively.
7.	**Assembly programs on memory locations** a. Write an assembly language program to separate even numbers from the given list of 50 numbers and store them in another list starting from 2300H. Assume starting address of 50 number list is 2200H. b. Write assembly language program with proper comments for the following: A block of data consisting of 256 bytes is stored in memory starting at 3000H. This block is to be shifted (relocated) in memory from 3050H onwards. Do not shift the block or part of the block anywhere else in the memory. c. Add even parity to a string of 7-bit ASCII characters. The length of the string is in memory location 2040H and the string itself begins in memory location 2041H. Place even parity in the most significant bit of each character. d. A list of 50 numbers is stored in memory, starting at 6000H. Find number of negative, zero and positive numbers from this list and store these results in memory locations 7000H, 7001H, and 7002H respectively. e. Write an assembly language program to generate Fibonacci number. f. Program to calculate the factorial of a number between 0 to 8.
8.	**String operations in assembly programs** a. Write an 8085-assembly language program to insert a string of four characters from the tenth location in the given array of 50 characters. b. Write an 8085-assembly language program to delete a string of 4 characters from the tenth location in the given array of 50 characters. c. Multiply the 8-bit unsigned number in memory location 2200H by the 8-bit unsigned number in memory location 2201H. Store the 8 least significant bits of the result in memory location 2300H and the 8 most significant bits in memory location 2301H. d. Divide the 16-bit unsigned number in memory locations 2200H and 2201H (most significant bits in 2201H) by the B-bit unsigned number in memory location 2300H store the quotient in memory location 2400H and remainder in 2401H.

	e. DAA instruction is not present. Write a sub routine which will perform the same task as DAA.
9.	**Calculations on memory locations** a. To test RAM by writing '1' and reading it back and later writing '0' (zero) and reading it back. RAM addresses to be checked are 40FFH to 40FFH. In case of any error, it is indicated by writing 01H at port 10. b. Arrange an array of 8-bit unsigned no in descending order. c. Transfer ten bytes of data from one memory to another memory block. Source memory block starts from memory location 2200H whereas destination memory block starts from memory location 2300H. d. Write a program to find the Square Root of an 8-bit binary number. The binary number is stored in memory location 4200H and store the square root in 4201H. e. Write a simple program to Split a HEX data into two nibbles and store it in memory.
10.	**Operations on BCD numbers** a. Add two 4-digit BCD numbers in HL and DE register pairs and store result in memory locations 2300H and 2301H. Ignore carry after 16 bits. b. Subtract the BCD number stored in E register from the number stored in D register. c. Write an assembly language program to multiply 2 BCD numbers.

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**
   a. **Internal Assessment:**
      - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
      - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

After studying this course, the student would gain enough knowledge on:

CO1: The Standard Architecture of Intel Microprocessor 8085.

CO2: Instruction set of Intel 8085 microprocessor and proficiency in assembly language programming.

CO3: Concepts associated with interfacing a microprocessor to memory and to I/O devices and to learn the programming of peripheral I/O devices.

CO4: Control components of a microprocessor-based system through the use of interrupts.

CO5: Background knowledge for understanding next-generation CPUs.

12. References:

1. Microprocessors Architecture, Programming and Applications with the 8085 By Ramesh Gaonkar, 5th Edition, PENRAM, 2012.
2. Computer System Architecture by M. Morris Mano and Rajib Mall, 3rd Edition, Pearson Education, 2017
3. Structured Computer Organization by Andrew S. Tanenbaum, 6th Edition, McGraw Hill, 2003.

COURSE STRUCTURE

1. **Title of the Course:** Object Oriented Programming using C++
2. **Semester**: II
3. **Course Code: For Theory:** BITSB204

   For Practical: BITSBP204
4. **Course Objective:**

   a. The objectives of the course are to have students identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes and class libraries, arrays, inheritance and file I/O stream concepts.

   b. Creating simple programs using classes and objects in C++.

   c. Implement Object Oriented Programming Concepts in C++.

   d. Develop applications using stream I/O and file I/O.

   e. Implement Object Oriented Programs using templates and exceptional handling concepts.

5. Category of Course: Core
6. Total Hours: 60
7. Total Credits: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. Modules:

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITSB204	Object Oriented Programming using C++	5	3	2	2	4

Module	Detailed Content	Hours
I	**Object Oriented Methodology**: Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS. **Principles of OOPS:** OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing	12

II	**Classes and Objects:** Simple classes (Class specification, class members accessing), Defining member functions, passing object as an argument, Returning object from functions, friend classes, Pointer to object, Array of pointer to object. **Constructors and Destructors:** Introduction, Default Constructor, Parameterized Constructor and examples, Destructors	12
III	**Polymorphism:** Concept of function overloading, overloaded operators, overloading unary and binary operators, overloading comparison operator, overloading arithmetic assignment operator, Data Conversion between objects and basic types, **Virtual Functions:** Introduction and need, Pure Virtual Functions, Static Functions, this Pointer, abstract classes, virtual destructors.	12
IV	**Program development using Inheritance:** Introduction, understanding inheritance, Advantages provided by inheritance, choosing the access specifier, Derived class declaration, derived class constructors, class hierarchies, multiple inheritance, multilevel inheritance, containership, hybrid inheritance. **Exception Handling:** Introduction, Exception Handling Mechanism, Concept of throw & catch with example	12
V	**Manipulating Strings:** Introduction to Strings, Creating and manipulating String Objects, Relational operations on Strings, Characteristics of Strings, Swapping strings, Comparing Strings. **Templates:** Introduction, Function Template and examples, Class Template and examples. **Working with Files:** Introduction, File Operations, Various File Modes, File Pointer and their Manipulation	12
	Total	60

Sr. No.	List of Practical
1.	a. Design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used repectively. Where getInfo() will be private method. b. Design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively.Where getData() will be private method. c. Design the class Demo which will contain the following methods: readNo() ,factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, isPalindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is armStrong or not.Where readNo() will be private method.
2.	a. Write a friend function for adding the two complex numbers, using a single class. b. Write a friend function for adding the two different distances and display its sum, using two classes.

	c. Write a friend function for adding the two matrix from two different classes and display its sum.
3.	a. Design a class Complex for adding the two complex numbers and also show the use of constructor. b. Design a class Geometry containing the methods area() and volume() and also overload the area() function . c. Design a class StaticDemo to show the implementation of static variable and static function.
4.	a. Overload the operator unary(-) for demonstrating operator overloading. b. Overload the operator + for adding the timings of two clocks, And also pass objects as an argument. c. Overload the + for concatenating the two strings. For e.g "c" + "++" = c++
5.	a. Design a class for single level inheritance using public and private type derivation. b. Design a class for multiple inheritance. c. Implement the hierarchical inheritance.
6.	a. Implement the concept of method overriding. b. Show the use of virtual function c. Show the implementation of abstract class.
7.	a. String operations for string length , string concatenation b. String operations for string reverse, string comparison, c. Console formatting functions.
8.	a. Show the implementation of exception handling b. Show the implementation for exception handling for strings c. Show the implementation of exception handling for using the pointers.
9.	a. Design a class FileDemo open a file in read mode and display the total number of words and lines in the file. b. Design a class to handle multiple files and file operations c. Design a editor for appending and editing the files
10.	a. Show the implementation of template class library for swap function. b. Design the template class library for sorting ascending to descending and vice-versa c. Design the template class library for concatenating two strings

9. Evaluation Pattern:

a. Total Marks : 150 Marks (10 Point Grading)

b. Passing Criteria : 40 % (4 Grade Points)

c. Marking Scheme : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. Mode of Evaluation of Answer-books : Online/Offline

10. Paper Pattern:

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination :

Question No.	**Description**	**Marks**
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. Semester End Practical Examination:

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Students will be able to:

CO1. Articulate the principles of object-oriented problem solving and programming.

CO2. Outline the essential features and elements of the C++ programming language.

CO3. Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism.

CO4. Analyze, write, debug, and test basic C++ codes using the approaches introduced in the course.

CO5. Analyze problems and implement simple C++ applications using an object-oriented software engineering approach.

12. References:

1. “Object Oriented Programming with C++” by Balagurusamy, 6e Paperback – May 20, 2013

2. “Object Oriented Programming in C++” by Robert Lafore, Paperback – 20 August 1999

3. “Object-Oriented Programming in C++” by Rajesh K Shukla, Paperback – 1 January 2008

4. “C++: The Complete Reference” by Herbert Schildt , 4th Edition Paperback – 1 July 2017

5. “Object Oriented Analysis and Design” by Timothy Budd, 3rd Edition TMH-2012

COURSE DETAILS

1) Title of the Course: Communication Skill

2) Course Code: For Theory : BITAE205

For Practical: BITAEP205

3) Course Objective:

1. Understand how they use their energy to work effectively.

2. Learn how to manage themselves better, especially when facing work situations which cause them stress.

3. Be more aware of the impact they have on other people.

4. Be more skillful at understanding how and why other people behave and react as they do.

4) Category of Course :Ability Enhancement Course

5) Semester : II

6) Total Hours:60 lectures

7) Total Credits:04 Credits (02 Credits for Theory & 02 Credits for Practical)

8) Modules:-

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITAE205	Communication Skill	5	3	2	2	4

Unit	Details	Lectures
I	**The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness **Understanding Business Communication:** Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication	**12**

II	**Writing Business Messages and Documents:** Business writing, Business Correspondence, Instructions Business Reports and Proposals, Career building and Resume writing. **Developing Oral Communication Skills for Business:** Effective Listening, Business Presentations and Public Speaking, Conversations, Interviews	**12**
III	**Developing Oral Communication Skills for Business:** Meetings and Conferences, Group Discussions and Team Presentations, Team Briefing, **Understanding Specific Communication Needs:** Communication across Functional Areas	**12**
IV	**Understanding Specific Communication Needs:** Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids	**12**
V	**Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates. Adding graphics to your presentation: Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance.	**12**
	Total	**60**

Practical List :-

List of Practical Questions:	
1.	Communication Origami, Guessing Game, Guessing the emotion
2.	Body Language, Follow All Instructions, Effective Feedback Skills
3.	The Name Game, Square Talk(Effective Communication), Room101(Influential and persuasive skills)
4.	Back to Back Communication, Paper Shapes(Importance of two-way communication), Memory Test(Presentation Skills)
5.	Exercises on Communication Principles

6.	Exercises on communication icebreakers
7.	Communication exercises
	For the following practicals, Microsoft Office, Open Office, Libre Office orany other software suite can be used.
8.	Use of word processing tools for communication
9.	Use of spreadsheet tools for communication
10.	Use of presentation tools for communication

9) Evaluation Pattern:

a. Total Marks: 150 Marks (10 Point Grading)

b. Passing Criteria : 40 % (4 Grade Points)

c. Marking Scheme: 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. Mode of Evaluation of Answer-books: Online/Offline

10) Paper Pattern:

a. Internal Assessment:

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. Semester End Theory Examination:

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10

5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. Semester End Practical Examination:

Exam Duration (in Hours)	Practical+ Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11) Course Outcome:

After studying this course the students would gain enough knowledge on:

1. Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.

2. Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication. I.e., students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.

3. Students will be able to understand the research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication.

4. Students will be able to find, use, and evaluate primary academic writing associated with the communication discipline.

5. Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others. Such skills could include communication competencies such as managing conflict, understanding small group processes, active listening, appropriate self-disclosure, etc.

6. Students will be able to communicate effectively orally and in writing.

12) References:

1. Business Communication Edited by Meenakshi Raman and Prakash Singh Oxford University Press Second.

2. Professional Communication Aruna Koneru Tata McGraw Hill

3. Strategies for improving your business communication Prof. M. S. Rao Shroff publishers and distributors 2016.

4. Business Communication Dr. Rishipal and Dr. Jyoti Sheoran SPD 2014.

5. Communication Skills Dr. Nageshwar Rao , Dr.Rajendra P. Das Himalaya Publishing House.

COURSE STRUCTURE

1. **Title of the Course :** Cyber Law
2. **Semester** : : II
3. **Course Code: For Theory:** BITID206
   For Practical: BITIDP206
4. **Course Objective:**
   a. The objective of this course is to enable learner to understand, explore, and acquire a critical understanding of Intellectual Property Rights and Cyber Law.
   b. How to Protect Intellectual Properties and legal procedures about them.
   c. Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cyber crimes for example, Child Pornography etc. that are taking place via the internet. To understand and use data manipulation language to query, update, and manage a database.
5. **Category of Course**: Inter-disciplinary Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical (Case Studies))
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Case Studies	Theory	Practical/ Case Studies	Total
BITID206	Cyber Law	5	3	2	2	4

Module	Detailed Content	Hours
1	**Basic Principles and Acquisition of Intellectual Property Rights:** Philosophical Aspects of Intellectual Property Laws, Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic	12

	Principles of Trade Mark, Basic Principles of Design Rights, International Background of Intellectual Property, Unfair Competition.	
2	**Information Technology Related Intellectual Property Rights:** Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defences, Patent Protection. **Database and Data Protection**: Objective, Need for Protection, UK Data Protection Act, 1998,US Safe Harbor Principle, Enforcement. **Protection of Semi-conductor Chips**: Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, TRIPs, SCPA. **Domain Name Protection:** Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, and International Perspective.	12
3	**Ownership and Enforcement of Intellectual Property :** Patents-Objectives, Rights, Assignments, Defences in case of Infringement Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement Trademarks-Objectives, Rights, Protection of good will, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement.	12
4	**Basic Concepts of Technology and Law :** Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence. **Law of Digital Contracts :** The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography. **Intellectual Property Issues in Cyber Space:** Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World. **Rights of Netizens and E-Governance :** Privacy and Freedom	12

	Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws	
5	**Information Technology Act 2000 :** Information Technology Act-2000-1 (Sec 1 to 13), Information Technology Act-2000-2 (Sec 14 to 42 and Certifying authority Rules), Information Technology Act-2000-3 (Sec 43 to 45 and Sec 65 to 78), Information Technology Act-2000-4(Sec 46 to Sec 64 and CRAT Rules), Information Technology Act-2000-5 (Sec 79 to 90), Information Technology Act- 2000-6 (Sec 91-94) Amendments in 2008. **International Scenario in Cyber Laws :** Data Protection Laws in EU and USA, Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.	12
	Total	60

Total 10 Practical Case Studies will be there based on over all syllabus.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks

1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical(Case Studies) + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Make learner conversant with the social and intellectual property rights and their issues emerging from cyberspace.

CO2: Explore the legal and policy developments in various countries to regulate cyberspace.

CO3: Develop the understanding of relationship between commerce and cyberspace.

CO4: Give learners in depth knowledge of Information Technology Act and Legal Framework of Right to Privacy, Data Security and Data Protection.

CO5: Make study on various case studies on real time crimes.

12. References:

1. "IT Governance: How Top Performers Manage IT Decision Rights for Superior Results" by Peter Weill , Jeanne Ross. Hardcover – 1 June 2004.
2. "Enterprise Architecture As Strategy: Creating a Foundation for Business Execution" by Jeanne W. Ross. Kindle Edition.
3. "IT Savvy: What Top Executives Must Know to Go from Pain to Gain" by Peter Weill. Harvard Business Press, 2009.
4. "How To Register Your Own Copyright" by Marx Warda, Sphinx Publishing.

Semester - III

Semester - III				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC301	**Core Subject**	**Digital Computer Networks**	**2**	**100**
BITCC302	**Core Subject**	**Applied Mathematics**	**2**	**100**
BITCC303	**Core Subject**	**Data Structures**	**2**	**100**
BITSB304	**Skill Based**	**Python Programming**	**2**	**100**
BITAE305	**Ability Enhancement**	**Programming Language SQL**	**2**	**100**
BITEL306 **BITEL307**	**Elective**	1. **Geographical Information System** 2. **Mobile Computing**	**2**	**100**
BITCCP301	**Core Subject Practical**	**Digital Computer Networks Practical**	**2**	**50**
BITCCP302	**Core Subject**	**-**	**-**	**-**
BITCCP303	**Core Subject**	**Data Structures Practical**	**2**	**50**
BITSBP304	**Skill Based**	**Python Programming Practical**	**2**	**50**
BITAEP305	**Ability Enhancement**	**Programming Language SQL Practical**	**2**	**50**
BITELP306 **BITELP307**	**Elective**	**Elective Practical**	**2**	**50**
		Total Credits	**22**	**850**

COURSE STRUCTURE

1. **Title of the Course:** Digital Communication Networks
2. **Semester**: III
3. **Course Code: For Theory:** BITCC301
   For Practical: BITCCP301
4. **Course Objective:**
   This course aims
   a. To understand the basics of Networks, its significance and its usage.
   b. To understand the services being offered at each layer of network protocol stack.
   c. To have understanding of different network protocols, network metrics and different applications of Internet.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC301	Digital Communication Networks	5	3	2	2	4

Module	Detailed Content	Hours
1	**Overview of Networks and Data communication:** Introduction to Data Communications, Computer Networking, Protocols and Standards, what is the Internet; Types of Network, Network Topology, Protocol hierarchies, and Design issues of layers, Interfaces and services; Layered protocol model: The OSI model, TCP/IP model; Network standards and policies, Uses of computer network, Network hardware, Network software. **Physical layer I:** Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance; Data Encoding and Transmission: Introduction, Digital data transmission over digital signal, Digital data transmission over analog signal, Analog data transmission over digital signal, Analog data transmission over analog signal.	12

2	**Physical Layer II:** Multiplexing, Transmission media, Wireless transmission, ISDN, ATM, Cellular Radio, Network edge: End systems, access networks, links; Network core: Packet switching, circuit switching, network structure, Switching techniques issues. **Introduction to the Data Link Layer:** Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.	12
3	**Data Link Control:** DLC services, data link layer protocols, HDLC, Point-to-point protocol. **Media Access Control:** Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet **Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. **Connecting devices and Virtual LANs.**	12
4	**Network Layer:** Design Issues, Connection Oriented and Connectionless networks, Interconnecting Devices, IP Protocol and Subnetting, Routing Algorithms: Shortest Path Routing: RIP, OSPF; Flooding, Distance Vector Routing, unicast routing protocols; Congestion Control and its Algorithms, Quality of Service, Internetworking, Addressing, N/W Layer Protocols: IPv4 & IPv6 and recent developments.	12
5	**Transport Layer:** The transport layer protocols and its services, Transport service primitives: Connection establishment, Connection release; Flow control: Multiplexing and Demultiplexing; TCP, UDP, Congestion control, QOS and its improvement. **Application layer:** The Domain Name System, DHCP, Electronic Mail, World Wide Web, Content delivery, Principles of Network applications, HTTP, Client Server Model and recent developments.	12
	Total	60

Sr. No.	**List of Practical**
1.	**IPv4 Addressing and Subnetting** a. Given an IP address and network mask, determine other information about the IP address such as: Network address, Network broadcast address, Total number of host bits, Number of hosts.

	b. Given an IP address and network mask, determine other information about the IP address such as: The subnet address of this subnet, The broadcast, address of this subnet, The range of host addresses for this subnet, The maximum number of subnets for this subnet mask, The number of hosts for each subnet, The number of subnet bits, The number of this subnet
2.	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
3.	Configure IP static routing.
4.	Configure IP routing using RIP.
5.	Configuring Simple OSPF.
6.	Configuring DHCP server and client.
7.	Create virtual PC based network using virtualization software and virtual NIC.
8.	Configuring DNS Server and client.
9.	Configuring OSPF with multiple areas.
10.	Use of Wireshark to scan and check the packet information of following protocols: HTTP, ICMP, TCP, SMTP, POP3.

9. Evaluation Pattern:

a. **Total Marks:** 150 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

On successful completion of this course, the Learner should be able to:

CO1: Understand the gravity and concepts of computer networks.

CO2: Conceptualize and appreciate the layered model for computer networking.

CO3: Identify basic protocols and design issues for layered model.

CO4: Explain various topological and routing strategies for IP based networks.

12. **References:**

1. Introduction to Data communication and Networking by Behrouz Forouzan, 5th Edition, Tata McGraw Hill, 2013.
2. Computer networks by Andrew S. Tanenbaum, 5th Edition, Pearson, 2013.
3. Data and computer communication by William Stallings, 10th Edition, Pearson, 2014.
4. TCP/IP Protocol suit by Behrouz Forouzan, 4th Edition, Tata McGraw Hill, 2010.
5. Computer Network by Natalia Olifer & Victor Olifer, 1st Edition, Wiley-India edition, 2006.

COURSE STRUCTURE

1. **Title of the Course:** Applied Mathematics
2. **Semester**: III
3. **Course Code: For Theory:** BITCC302
4. **Course Objective:**

   The course is aimed to develop the basic Mathematical skills of learners that are imperative for effective understanding of information technology subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

   a. Matrices: To provide knowledge of matrices which is applied for solving system of linear equations and useful in various fields of technology.
   b. Complex numbers: This course enables the learner to learn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of area of subjects like electrical circuits and complex analysis etc.
   c. Differential Equation: This course enables the learners to understand the concept of Differential equation and its applications.
   d. Laplace Transform: This course enables the learners to understand the concept of Laplace Transform and its usability in the field of Information Technology.
   e. This course will also enable the learners to understand the concept of multiple integrals, Beta Function, Gamma Function, DUIS etc. and its usability in the field of Information Technology.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 02 Credits (02 Credits for Theory)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC302	Applied Mathematics	5	-	2	-	2

Module	Detailed Content	Hours
1	**Matrices:** Inverse by Adjoint Method, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse by Reduction Method, Linear equations, Linear dependence and independence of vectors, Linear transformation, Characteristics Roots and Characteristics Vectors, Properties of characteristic vectors, Caley-Hamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix.	12

	Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number (Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x & y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular & hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j(=i) as an operator (Electrical circuits).	
2	**Equation of first order & first degree:** Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution. **Differential equation of first order & Degree higher than first:** Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution. **Linear Differential Equations with Constant Coefficients:** Introduction, Differential Operator, Linear Differential Equation f(D)y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, Complimentary Function, Inverse Operator 1/f(D) and the particular integral 1/f(D) X; the general methods, Particular integral: Short methods, Particular integral: Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	12
3	**Laplace Transform:** Introduction, Definition, Standard Formulae, Theorems on Important Properties of Laplace Transformation: First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives. Laplace Transformation of Special Function: Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function (Unit Impulse Function). **Inverse Laplace Transform:** Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations.	12

4	**Multiple Integrals:** Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. **Applications of Integration:** Area, Volumes of solids.	12
5	**Beta and Gamma Functions:** Definitions, Properties and Problems. Duplication formula. **Differentiation Under the Integral Sign** **Error Functions**	12
	Total	60

9. Evaluation Pattern:

a. **Total Marks:** 100 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

11. Course Outcome:

On successful completion of this course, the Learner should be able to:

CO1: Apply the knowledge of matrices to solve the problems in field of Image processing, Computer Graphics, Network Security etc.

CO2: Ability to interpret the mathematical results in physical or practical terms for complex numbers.
CO3: Solve and analyse the Differential Equations & Application in related field of engineering.
CO4: Solve and analyse Laplace Transform in fields like Image processing.
CO5: Ability to interpret the mathematical results in physical or practical terms for multiple integrals.
CO6: Ability to interpret the mathematical results in physical or practical terms for special cases like Beta function, Gamma function, DUIS, Error Function.

12. **References:**

1. A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar, Vol – I and – II , 9th Edition, Pune Vidyarthi Graha, 2010.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, 42nd Edition, Khanna Publication, 2017.
3. Advanced Engineering Mathematics by Erwin Kreyszig, 9th Edition, Wiley Eastern Limited.
4. A Textbook of Matrices by Shanti Narayan & P K Mittal, S. Chand publication, 1953.
5. Elementary Linear Algebra Application by Howard Anton and Christ Rorres, 11th edition, Wiley.

COURSE STRUCTURE

1. **Title of the Course :** Data Structure
2. **Semester** : III
3. **Course Code: For Theory:** BITCC303
   For Practical: BITCCP303
4. **Course Objective:**
   a. To impart the basic concepts of data structures and algorithms
   b. To understand concepts about searching and sorting techniques
   c. To Understand basic concepts about stacks,queues,lists,trees and graphs
   d. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
5. **Category of Course** : Core Subject
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC303	Data structure	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure ,Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. **Array**: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General Multidimensional Arrays, Sparse Arrays, Sparse Matrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.	12

2	**Linked List:** Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.	12
3	**Stack:** Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion. **Queue:** Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues	12
4	**Sorting and Searching Techniques**: Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches, Binary Search. **Tree:** Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. **Advanced Tree Structures:** Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2- 3 Tree, B-Tree.	12
5	**Hashing Techniques:** Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing **Graph:** Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	12

	Total	60

Sr. No.	List of Practical
1	**Implement the following:** a. Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven] b. Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven] c. Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
2	**Implement the following for Linked List:** a. Write a program to create a single linked list and display the node elements in reverse order. b. Write a program to search the elements in the linked list and display the same c. Write a program to create double linked list and sort the elements in the linked list.
3	**Implement the following for Stack:** a. Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations. b. Write a program to convert an infix expression to postfix and prefix conversion.
4	**Implement the following for Queue:** a. Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations. b. Write a program to implement the concept of Circular Queue c. Write a program to implement the concept of Deque.
5	**Implement the following sorting techniques**: a. Write a program to implement bubble sort. b. Write a program to implement selection sort. c. Write a program to implement insertion sort.
6	**Implement the following data structure techniques:** a. Write a program to implement merge sort. b. Write a program to search the element using sequential search. c. Write a program to search the element using binary search.
7	**Implement the following data structure techniques:** a. Write a program to create the tree and display the elements. b. Write a program to construct the binary tree. c. Write a program for inorder, postorder and preorder traversal of tree
8	**Implement the following data structure techniques:** a. Write a program to insert the element into maximum heap.

	b. Write a program to insert the element into minimum heap
9	**Implement the following data structure techniques:** a. Write a program to implement the collision technique. b. Write a program to implement the concept of linear probing
10	**Implement the following data structure techniques:** a. Write a program to generate the adjacency matrix. b. Write a program for shortest path diagram.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to:

CO1: Ability to analyse algorithms and algorithm correctness

CO2: Ability to summarize searching and sorting techniques

CO3: Ability to describe stack, queue and linked list operation.

CO4: Ability to have knowledge of tree and graphs concepts.

12. **References:**

1. A Simplified Approach to Data Structures Lalit Goyal, Vishal Goyal, Pawan Kumar SPD 1st 2014
2. An Introduction to Data Structure with Applications Jean – Paul Tremblay and Paul Sorenson Tata MacGraw Hill 2nd 2007
3. Data Structure and Algorithm Maria Rukadikar SPD 1st 2017
4. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2nd 2005
5. Data structure – A Pseudo code Approach with C AM Tanenbaum, Y Langsam and MJ Augustein Prentice Hall India 2nd 2006
6. Data structure and Algorithm Analysis in C Weiss, Mark Allen Addison Wesley 1st 2006

COURSE STRUCTURE

1. **Title of the Course :** Python Programming
2. **Semester** : III
3. **Course Code: For Theory: BITSB304**
   For Practical: BITSBP304
4. **Course Objective:**

The learning objectives of this course are:

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.

5. **Category of Course** : Skill Based
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITSB304	Python Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, **Variables and Expressions** Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. **Conditional Statements:** if, if-else, nested if –else **Looping**: for, while, nested loops **Control statements:** Terminating loops, skipping specific conditions.	12
2	**Functions:** Function Calls, Type Conversion Functions, Math	12

	Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types **Strings:** A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.	
3	**Lists:** Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, `In` Operator, Built-in List functions and methods **Tuples and Dictionaries:** Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, `in` Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods **Files:** Text Files, The File Object Attributes, Directories, **Exceptions:** Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions	12
4	**Regular Expressions –** Concept of regular expression, various types of regular expressions, using match function. **Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding **Multithreaded Programming:** Thread Module, creating a thread, synchronizing threads, multithreaded priority queue **Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module	12
5	**Creating the GUI Form and Adding Widgets:** **Widgets:** Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text,Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox.Handling Standard attributes and Properties of Widgets. **Layout Management:** Designing GUI applications with proper Layout Management features. **Look and Feel Customization**: Enhancing Look and Feel of GUI using different appearances of widgets. **Storing Data in Our MySQL Database via Our GUI :** Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database,	12

	Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	
	Total	60

Sr. No.	List of Practical
1	**Write the program for the following:** a.Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old. b. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user. c. Write a program to generate the Fibonacci series. d. Write a function that reverses the user defined value. e. Write a function to check the input value is Armstrong and also write the function for Palindrome. f. Write a recursive function to print the factorial for a given number.

2	**Write the program for the following:**
	a.Write a function that takes a character (i.e. a string of length 1) and returns True
	if it is a vowel, False otherwise.
	b. Define a function that computes the *length* of a given list or string.
	c. Define a *procedure* `histogram()` that takes a list of integers and prints a histogram to the screen. For example, `histogram([4, 9, 7])` should print the
	following:
	`****`
	`*********`
	`*******`

3	**Write the program for the following:** a.A *pangram* is a sentence that contains all the letters of the English alphabet at least once, for example: *The quick brown fox jumps over the lazy dog*. Your task here is to write a function to check a sentence to see if it is a pangram or not. b. Take a list, say for example this one: `a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]` and write a program that prints out all the elements of the list that are less than 5.
4	**Write the program for the following:** a.Write a program that takes two lists and returns True if they have at least one common member. b. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.

	c. Write a Python program to clone or copy a list
5	**Write the program for the following:** a.Write a Python script to sort (ascending and descending) a dictionary by value. b. Write a Python script to concatenate following dictionaries to create a new one. Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60} c. Write a Python program to sum all the items in a dictionary.
6	**Write the program for the following:** a.Write a Python program to read an entire text file. b. Write a Python program to append text to a file and display the text. c. Write a Python program to read last n lines of a file.
7	**Write the program for the following:** a.Design a class that store the information of student and display the same b. Implement the concept of inheritance using python c. Create a class called `Numbers`, which has a single class attribute called `MULTIPLIER`, and a constructor which takes the parameters `x` and `y` (these should all be numbers). i. Write a method called `add` which returns the sum of the attributes `x` and `y`. ii. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER. iii. Write a static method called subtract, which takes two number parameters, b and c, and returns b - c. iv. Write a method called value which returns a tuple containing the values of x and y. Make this method into a property, and write a setter and a deleter for manipulating the values of `x` and `y`.
8	**Write the program for the following:** Open a new file in IDLE (“New Window” in the “File” menu) and save it as geometry.py in the directory where you keep the files you create for this course.Then copy the functions you wrote for calculating volumes and areas in the “Control Flow and Functions” exercise into this file and save it. Now open a new file and save it in the same directory. You should now be able to import your own module like this: `import geometry` Try and add `print dir(geometry)` to the file and run it. Now write a function pointyShapeVolume(x, y, squareBase) that calculates the volume of a square pyramid if squareBase is True and of a right circular cone if squareBase is False. x is the length of an edge on a square if squareBase is True and the radius of a circle when squareBase is False. y is the height of the object.First use squareBase to distinguish the cases. Use the

	circleArea and squareArea from the geometry module to calculate the base areas. b. Write a program to implement exception handling.
9	**Write the program for the following:** a.Try to configure the widget with various options like: bg=”red”, family=”times”, size=18 b. Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.
10	**Design the database applications for the following:** Design a simple database application that stores the records and retrieve the same. b. Design a database application to search the specified record from the database. c. Design a database application to that allows the user to add, delete and modify the records

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10

4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, Learner should be able to:

CO1: Explain basic principles of Python programming language

CO2: Implement object oriented concepts.

CO3: Implement database and GUI applications.

12. References:

1.Think Python Allen Downey O'Reilly 1st 2012

2. An Introduction to Computer Science using Python 3 Jason Montojo, Jennifer Campbell, Paul Gries SPD 1st 2014.

3. Python GUI Programming Cookbook Burkhard A. Meier Packt 2015

4.Fundaments of Database System by Ramez Elmasri and Shamkant B. Navathe, 7th Edition, Pearson Education India, 2010

5. Object-oriented Programming in Python Michael H. Goldwasser, David Letscher Pearson Prentice Hall 1st 2008.

COURSE STRUCTURE

1. **Title of the Course : Programming language in SQL**
2. **Semester** : III
3. **Course Code: For Theory:** BITAE305
   For Practical: BITAEP305
4. **Course Objective:**
   a. The objective of this course is to enable learner to use different sub-queries to generate query output.
   b. Manipulating & Retrieving table data records by using cube, roll up & indexing.
   c. Develop efficient **PL/SQL** programs to access **Oracle** databases.
   d. Use some of the **Oracle** supplied **PL/SQL** packages to generate screen and file outputs.
   e. Use PL/SQL programming constructs and conditionally control code flow (loops, Control structures.
   f. Design modular applications using packages, procedures and functions.
   g. Invoke native dynamic **SQL** to build runtime **SQL** statements.
   h. Manage data retrieval with cursors and cursor variables.
5. **Category of Course**: Ability Enhancement Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical (Case Studies))
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Case Studies	Theory	Practical/ Case Studies	Total
BITAE 305	Programming language in SQL	5	3	2	2	4

Module	Detailed Content	Hours
1	**Advanced Structured Query Language:** Sub-queries, Manipulating Data, Creating and Managing Tables, Creating other Database Objects like Sequences, Indexes and Synonyms. Controlling user Access, using SET operators, Data Time Functions, Enhancements to Group by clause (Cube, Rollup and Grouping), Advanced Sub-	12

	queries (Multiple column sub-queries, Sub-queries in FROM clause, Scalar and correlated sub-queries), WITH Clause, Hierarchical retrieval.	
2	**PLSQL :** Introduction, Overview and benefits of PL/SQL, Subprograms, types of PL/SQL blocks, Simple Anonymous Block, Identifiers, types of identifiers, Declarative Section, variables, Scalar Data Types, The %Type attribute, bind variables, sequences in PL/SQL expressions, Executable statements, PL/SQL block syntax, comment the code, deployment of SQL functions in PL/SQL, Convert Data Types, nested blocks, operators. Interaction with the oracle server, Invoke SELECT Statements in PL/SQL, SQL cursor concept, Data Manipulation in the Server using PL/SQL, SQL Cursor Attributes to obtain Feedback on DML, Save and discard transactions.	12
3	**Control Structures :** Conditional processing using IF statements and CASE statements, Loop Statement, while loop statement, for loop statement, the continue statement composite data types : PL/SQL records, The % ROWTYPE attribute, insert and update with PL/SQL records, INDEX by tables, INDEX BY Table Methods, Use INDEX BY Table of Records, Explicit Cursors, Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Cursor FOR loop, The % NOTFOUND and %ROWCOUNT Attributes, the FOR UPDATE Clause and WHERE CURRENT Clause, Exception Handling, Handle Exceptions with PL/SQL, Trap Predefined and nonpredefined Oracle Server Errors, User – Defined Exceptions, Propagate Exceptions, RAISE_APPLICATION_ERROR Procedure	12
4	**Stored Procedures and Functions :** Create a Modularized and Layered Subprogram Design, the PL/SQL Execution Environment, differences between Anonymous Blocks and Subprograms, Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes, View Procedure Information, Stored Functions and Debugging Subprograms, Create, Call, and Remove a Stored Function, advantages of using Stored Functions, the steps to create a stored function, Invoke User-Defined Functions in SQL Statements, Restrictions when calling Functions, Control side effects when calling Functions, View Functions Information, debug Functions and Procedures, Packages, advantages of Packages, components of a Package, Develop a Package, enable visibility of a Package's	12

	Components, Create the Package Specification and Body using the SQL CREATE Statement and SQL Developer, Invoke the Package Constructs, View the PL/SQL Source Code using the Data Dictionary, Deploying Packages, Overloading Subprograms in PL/SQL.	
5	**Dynamic SQL :** Dynamically Executing a PL/SQL Block, Configure Native Dynamic SQL to Compile PL/SQL Code, invoke DBMS_SQL Package, Implement DBMS_SQL with a Parameterized DML Statement, Dynamic SQL Functional Completeness, Triggers, the Triggers, Create DML Triggers using the CREATE TRIGGER Statement and SQL Developer, Identify the Trigger Event Types, Body, and Firing (Timing), Statement Level Triggers and Row Level Triggers, Create Instead of and Disabled Triggers, Manage, Test and Remove Triggers. Creating Compound, DDL and Event Database Triggers, Compound Trigger Structure for Tables and Views, Compound Trigger to Resolve the Mutating Table Error, Comparison of Database Triggers and Stored Procedures, Create Triggers on DDL Statements, Create Database-Event and System-Events Triggers, System Privileges Required to Manage Triggers.	12
	Total	60

Sr. No	List of Practical
1	**Implementation of Set Operations & Single Row Functions. (Number, Character and Date Time functions)**
2	**Implementation of Sub Queries / Nested Queries.**
3	**Creation of Synonyms, Sequence, Indexes, WITH Clause, Hierarchical retrieval.**
4	**Implementation of Cube & Roll up And User Rights.**
5	**Study of PL/ SQL block.**
6	**Write a PL/SQL block to satisfy some conditions by accepting input from the user.**
7	**Write a PL/SQL block that handles all type of exceptions.**
8	**Creation of Procedures & Implementation of Functions.**
9	**Write a PL/SQL block that handles types of Cursors, Cursor Variables , attributes & loops.**

10	**Implementation of Triggers – Row level and Statement level triggers.**

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical(Case Studies) + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to:

CO1: Gain the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.

CO2: Explore the use of Procedures, Functions, Packages, and Triggers.

CO3: Develop the understanding of the PL/SQL code constructs of IF-THEN-ELSE and LOOP types as well as syntax and command functions.

CO4: Learn programming, management, and security issues of working with PL/SQL program units.

CO5: Examine the characteristics of PL/SQL and how it is used to extend and automate SQL to administer the Oracle database.

12. **References:**

1. Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
2. Oracle Database 11g PL/SQL Programming Workbook, ISBN :9780070702264, By : Michael McLaughlin, John Harper, Tata McGrawHill. "IT Savvy: What Top Executives Must Know to Go from Pain to Gain" by Peter Weill. Harvard Business Press, 2009.
3. Oracle PL/SQL Programming, Fifth Edition By Steven Feuerstein, Bill Pribyl.
4. Oracle 11g : PL/SQL Reference Oracle Press.
5. Expert Oracle PL/SQL, By : Ron Hardman, Michael McLaughlin, Tata McGraw-Hill.
6. Oracle database 11g : hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition.

COURSE STRUCTURE

1. **Title of the Course :** Geographical Information System
2. **Semester** : III
3. **Course Code: For Theory:** BITEL306
   For Practical: BITPEL306
4. **Course Objective:**
   a. Describe what GIS is; name the major GIS software available; know where to find more information.
   b. Explain the components and functionality of a GIS and the differences between GIS and other information systems.
   c. Understand the nature of geographic information and explain how it is stored in computer (including map projection) and the two types of GIS data structure.
   d. Conduct simple spatial analysis using GIS software;
   e. Design and complete a GIS project from start to finish (data capture, data storage and management, analysis, and presentation).
5. **Category of Course** : Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to GIS** **The nature of GIS:** Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. **The real world and representations of it:** Models and modelling, Maps, Databases, Spatial databases and spatial analysis. **Geographic Information and Spatial Database** **Models and Representations of the real world** **Geographic Phenomena:** Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic	12

	objects, Boundaries **Computer Representations of Geographic Information:** Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects **Organizing and Managing Spatial Data The Temporal Dimension**	
2	**Data Management and Processing Systems** **Hardware and Software Trends** **Geographic Information Systems:** GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) **Stages of Spatial Data handling:** Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. **Database management Systems:** Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. **GIS and Spatial Databases:** Linking GIS and DBMS, Spatial database functionality.	12
3	**Spatial Referencing and Positioning** **Spatial Referencing:** Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations **Satellite based Positioning:** Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology **Data Entry and Preparation** **Spatial Data Input:** Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere **Data Quality:** Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency **Data Preparation:** Data checks and repairs, Combining data from multiple sources **Point Data Transformation:** Interpolating discrete data, Interpolating continuous data	12
4	**Spatial Data Analysis** **Classification of analytical GIS Capabilities** **Retrieval, classification and measurement:** Measurement, Spatial selection queries, Classification **Overlay functions:** Vector overlay operators,Raster overlay operators **Neighbourhood functions:** Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis. **Analysis:** Network analysis, interpolation, terrain modeling **GIS and Application models:**GPS, Open GIS Standards, GIS Applications and Advances. **Error Propagation in spatial data processing:** How Errors	12

	propagate, Quantifying error propagation.	
5	**Data Visualization** **GIS and Maps, The Visualization Process** **Visualization Strategies: Present or explore?** **The cartographic toolbox:** What kind of data do I have? How can I map my data? **How to map?** How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination	12
	Total	60

Sr. No.	List of Practical
1	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
2	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
3	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
4	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data
5	Working with attributes, terrain Data
6	Working with Projections and WMS Data
7	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
8	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
9	Advanced GIS Operations 1:Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
10	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation withPrint Composer Atlas
11	Validating Map data

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	**Description**	**Marks**
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to:

CO1: Develop and manage geodatabases.

CO2: Demonstrate organizational skills in file and database management.

CO3: Apply GIS analysis to address geospatial problems and/or research questions.

CO4: Effectively communicate and present project results in oral, written, and graphic forms.

CO5: Analyze spatial data, using GIS analysis tools.

CO6: Create maps, images and apps to communicate spatial data in a meaningful way to others.

CO7: Relate GIS with remote sensing technologies.

12. **References:**

1. Principal of Geographical Information System By Otto Huisman and Rolf , 4th Edition, The International Institute of Geoinformation Science and Earth Observation, 2009
2. Principles of Geographic Information SystemsP.A Burrough and R.A.McDonnell, 3th Edition, Oxford University Press, 1999
3. Fundamentals of Spatial Information Systems, by R.Laurini and D. Thompson, 3rd Edition, Academic Press, 1994
4. Fundamentals of Geographic Information Systems by Michael N. Demers, 4th Edition, Pearson Education India, 2009
5. Introduction to Geographic Information System by Chang Kang-tsung(Karl), 3rd Edition,2013
6. GIS Fundamentals: A First Text on Geographic Information Systems by Paul Bolsatd, 5th Edition.

COURSE STRUCTURE

1. **Title of the Course :** Mobile Computing
2. **Semester** : III
3. **Course Code: For Theory:** BITEL307
   For Practical: BITPEL307
4. **Course Objective:**
   a. Understanding hybrid mobile application development approach for mobile platforms using one of the most powerful open source framework : "Apache Cordova".
   b. It will give us a readymade cooked platform for creating and hosting mobile applications on major platforms like android, ios, windows, blackberry etc.
   c. Design and development of app using HTML, CSS, JavaScript.
5. **Category of Course** : Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction of Cordova :** Overview, Environment SetupCordova - First Application Config.xml, FileCordova - Storage, Understanding the concept of phonegap, HTML various tags like text formatting tags, Table tags, Forms Tags, Image Tags.	12
2	**Introduction of CSS :**Overview, Types of CSS, Online Internal, External, Various property and value of web design **Cordova Events :** What is event, understanding the concept of event in cordova, Back Button.	12
3	**Cordova Plugman :** What is plugin, Study and Use various plugin in cordova, Cordova - Battery Status, Cordova - Camera, Cordova - ContactsCordova - Device, Cordova - Accelerometer, Cordova - Device Orientation, Cordova - DialogsCordova - File System, Cordova - File Transfer	12

4	**Plugin:** Cordova - Geolocation, Cordova - Globalization, Cordova - InAppBrowser, Cordova - Media, Cordova - Media Capture, Cordova - Network Information, Cordova - Splash Screen Cordova - Vibration	12
5	**Sqlite Plugin:** Use of sqlite plugin with PhoneGap / apache Cordova Using Sqlite read/write and search, Populating Cordova SQLite storage with the JQuery API	12
	Total	60

Sr. No.	List of Practical
1	Creating and building simple "Hello World" App using Cordova
2	Adding and Using Buttons
3	Creating and Using Functions, Handling and Using Back Button,
4	Installing and Using Plugins, Battery Plugin, Accelerometer Plugin, Camera Plugin.
5	Installing and Using Vibration Plugin
6	Developing Single Page Apps
7	Storing Data Locally in a Cordova App
8	Developing Multipage Apps
9	Use of sqlite plugin with PhoneGap / apache Cordova
10	Using Sqlite read/write and search

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Understanding the hybrid mobile development platform .
CO2: Add and use various plugin.
CO3: Developing Mobile Applications with Cordova and PhoneGap

12. References:

1. Apache Cordova 4 Programming By John M. Wargo , 1th Edition, 2015
2. Apache Cordova in Action by Raymond Camden, 1st Edition, Manning Publications, 2015
3. PhoneGap By Example, by Andrey Kovalenko, 1st Edition,2015

Semester – IV

Semester - IV				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC401	**Core Subject**	**Embedded Systems**	**2**	**100**
BITCC402	**Core Subject**	**Statistical Techniques & Testing of Hypothesis**	**2**	**100**
BITCC403	**Core Subject**	**Software Engineering and Testing**	**2**	**100**
BITSB404	**Skill Based**	**Java Programming**	**2**	**100**
BITAE405	**Ability Enhancement**	**Analytical Reasoning**	**2**	**100**
BITEL406 **BITEL407**	**Elective**	1. **Computer Graphics and Animation** 2. **Introduction to R and R studio**	**2**	**100**
BITCCP401	**Core Subject Practical**	**Embedded Systems Practical**	**2**	**50**
BITCCP402	**Core Subject**	**Statistical Techniques & Testing of Hypothesis Practical**	**2**	**2**
BITCCP403	**Core Subject**	**Software Engineering and Testing Practical**	**2**	**50**
BITSBP404	**Skill Based**	**Java Programming Practical**	**2**	**50**
BITAEP405	**Ability Enhancement**	**Analytical Reasoning Practical**	**-**	**-**
BITELP406 **BITELP406**	**Elective**	**Elective Practical**	**2**	**50**
		Total Credits	**22**	**850**

COURSE STRUCTURE

1. **Title of the Course :** Introduction to Embedded Systems
2. **Semester** : IV
3. **Course Code: For Theory:** BITCC401
   For Practical: BITPCC401
4. **Course Objective:**
   a. This course is structured to combine lectures, for the students to gain an in-depth understanding of fundamental concepts on embedded systems.
   b. To provide in-depth knowledge about embedded processor, its hardware.
   c. To explain programming concepts and embedded programming in C
   d. To explain real time operating systems.
5. **Category of Course** : Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT106	Introduction to Database Management System	5	3	2	2	4

Module	Detailed Content	Hours
1	Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components. Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.	12
2	Embedded Systems – Application and Domain Specific: Application specific – washing machine, domain specific -	12

	automotive. Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.	
3	The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. 8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.	12
4	Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051. Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging.	12
5	Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Design and Development: Embedded system development Environment – IDE, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry. Introduction to Arduino, Arduino IDE, Operating the Arduino IDE, loading a simple program. Arduino Programming.	12
	Total	60

Sr. No.	**List of Practical**
1	Write a 8051 program to Blink LED [00/FF]
2	Write a 8051 program to Blink Led [AA & 55]
3	Write a 8051 program to find ASCII Value
4	Write a 8051 Binary Increment Program
5	Write a 8051 C program Left Shift Right Shift Led
6	Write a 8051 program for Rotating stepper Motor clockwise Direction
7	Write a 8051 program for Rotating stepper Motor anticlockwise direction
8	Write a program to communicate with Serial communication, displaying output on the virtual terminal

9	Write a program to rotate Stepper Motor using proteous
10	Write a program Square wave using Oscilloscope in Keil v 5 / proteous
11	Write a program Sign wave using Oscilloscope in Keil v 5 / proteous
12	Write a program Triangular wave using Oscilloscope in Keil v 5 / proteous
13	Write a program to display Numbers on 7 segment Led
14	Write a program to process Elevator Control /Lift Control in Proteous
15	Write a program to display Traffic Signal Control
16	Writing a program to blink the onboard LED using Arduino.

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**
   a. **Internal Assessment:**
      - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
      - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

   b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10

5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

a. Understand the hardware and software components as well as their development cycles.
b. Understand the deployment of embedded processors and supporting devices. 8051 programming in C designing of embedded system with8051.

12. References:

1. Programming Embedded Systems in C and C++ Michael Barr O'Reilly First 1999

2. Introduction to embedded systems Shibu K V Tata Mcgraw-Hill First 2012

3. The 8051 Microcontroller and Embedded Systems Muhammad Ali Mazidi Pearson Second 2011

4. Embedded Systems Rajkamal Tata Mcgraw-Hill

5. Arduino for Dummies, by John Nussey (2013),

COURSE STRUCTURE

1. **Title of the Course:** Statistical Techniques & Testing of Hypothesis
2. **Semester**: IV
3. **Course Code: For Theory:** BITCC402
   For Practical: BITCCP402
4. **Course Objective:**

   This course aims
   a. To equip the students with a working knowledge of probability, statistics and modelling in the presence of uncertainties.
   b. To understand the concept of hypothesis and significance tests.
   c. To help the students to develop an intuition and an interest for random phenomena.
   d. To introduce both theoretical issues and applications that may be useful in real life.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC402	Statistical Techniques & Testing of Hypothesis	5	3	2	2	4

Module	Detailed Content	Hours
1	**Measures of Central Tendency & Measures of Dispersion:** Frequency Distribution, Histogram, Stem and leaf diagram, Ogives, Frequency Polygon, Mean, Median, Mode, Empirical relation between Mean, Median & Mode, Quartiles, Deciles, and Percentiles; Dispersion, Range, Box whisker plot, Mean Deviation, Quartile Deviation, Standard Deviation, Variance, Semi- Interquartile Range, 10–90 Percentile Range, Empirical relations between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation, Standard Scores.	12
2	**Moments, Skewness, and Kurtosis:** Moments, Moments for Grouped Data, Relations between Moments, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Population Moments, Skewness, Types of Skewness, Kurtosis, Types of Kurtosis.	12

	Introduction to Probability: Random experiment, Sample space, Events, Axiomatic Probability, Algebra of events, Conditional Probability, Multiplication theorem of Probability, Independent events, Baye's Theorem. **Elementary Sampling Theory:** Sampling Theory, Random Samples and Random Numbers, Sampling with and without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors.	
3	**Statistical Estimation Theory:** Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. **Statistical Decision Theory:** Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; Power of a Test, p-Values for Hypotheses Tests, Control Charts, Tests Involving Sample Differences, Tests Involving Binomial Distributions.	12
4	**Small Sampling Theory:** Small Samples, Student t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, Chi- Square Distribution, Confidence Intervals for Sigma, Degrees of Freedom, F Distribution. **The Chi-Square Test:** Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi- square.	12
5	**Curve Fitting and the Method of Least Squares:** Relationship between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, Straight Line Method, Method of Least Squares, Least-Squares Line, Nonlinear Relationships, Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables. **Correlation Theory:** Correlation and Regression, Linear Correlation, Measures of Correlation, Least-Squares Regression Lines, Standard Error of	12

	Estimate, Explained and Unexplained Variation, Coefficient of Correlation, Product-Moment Formula, Short Computational Formulas, Regression Lines and Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.	
	Total	60

Sr. No.	List of Practical
1.	Using R execute the basic commands, array, list and frames.
2.	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
3.	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram.
4.	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram.
5.	Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance.
6.	Using R import the data from Excel / .CSV file and draw the skewness.
7.	Import the data from Excel / .CSV and perform the hypothetical testing.
8.	Import the data from Excel / .CSV and perform the Chi-squared Test.
9.	Using R perform the binomial and normal distribution on the data.
10.	Perform the Linear Regression using R.
11.	Compute the Least squares means using R.
12.	Compute the Linear Least Square Regression

9. Evaluation Pattern:

a. **Total Marks:** 150 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

On successful completion of this course, the Learner should be able to:

CO1: Distinguish between quantitative and categorical data.

CO2: Apply different statistical measures on data.

CO3: Identify, formulate and solve problems on Statistics and Hypothesis.

CO4: Classify different types of Probability and their fundamental applications.

12. References:

1. Fundamental of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, 11th Revised Edition, Sultan Chand and Sons, 2011.
2. Mathematical Statistics by J.N. Kapur & H.C. Saxena, 12th Revised Edition, S. Chand, 2005.
3. Introduction to Probability & Statistics by J.Susan Milton & Jesse C. Arnold, 4th Edition, Tata McGraw Hill, 2007.
4. Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers by Yates, R. D., & Goodman, D. J., 3rd Edition, Wiley, 2014.
5. Schaum's Outlines Probability, Random Variables & Random Process 3rd Edition Tata McGraw Hill, 2014.
6. Hands-On Programming with R: Write Your Own Functions and Simulations by Garrett Gorlemund, 1st Edition, O'Reilly, 2017.
7. R for Everyone: Advanced Analytics and Graphics by Jared P. Lander, 2nd Edition, O'Reilly, 2017.

COURSE STRUCTURE

1. **Title of the Course :** Software Engineering and Testing
2. **Semester** : IV
3. **Course Code: For Theory:** BITCC403
   For Practical: BITCCP403
4. **Course Objective:**
   a. The study of the fundaments of software engineering principles and practices, including project management, configurations management, requirements definition, system analysis, design, testing and deployment.
   b. Knowledge of basic SW engineering methods and practices, and their appropriate application and also describe software engineering layered technology and Process frame work.
   c. A general understanding of software process models such as the waterfall and evolutionary models.
   d. Understanding of software requirements and the SRS documents.
   e. Understanding of the role of project management including planning, scheduling, risk management, etc.
   f. Describe data models, object models, context models and behavioral models.
   g. Understanding of different software architectural styles.
   h. Understanding of approaches to verification and validation including static analysis, and reviews.
   i. Understanding of software testing approaches such as unit testing and integration testing.
   j. Understanding on quality control and how to ensure good quality software.

5. **Category of Course**: Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/	Theory	Practical/	Total

			Tutorial		Tutorial	
BITCC 403	Software Engineering and Testing	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc. **Software Requirements:** Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements. **Software Processes:** Process and Project, Component Software Processes. **Software Development Process Models.** • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process. • The RAD Model • Time boxing Model. **Agile software development**: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.	12
2	**Socio-technical system:** Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems. **Critical system:** Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems. **Requirements Engineering Processes:** Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management. **System Models:** Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.	12
3	**Architectural Design:** Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures. **User Interface Design:** Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface	12

	Evaluation. **Project Management:** Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management. **Quality Management:** Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.	
4	**Software Measurement:** Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics. **Software Cost Estimation:** Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing. **Process Improvement:** Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.	12
5	**Verification and Validation:** Planning Verification and Validation, Software Inspections, Review Process, Automated Static Analysis. **Software Testing:** What is Testing? Testing principles, Fundamental Test Process, Test levels – Unit Testing, Integration testing, System Testing, Component Testing, Test types: Black Box testing and White Box Testing Techniques, Maintenance testing. **Test Design Techniques –** Identifying test conditions and designing test cases, Test planning, monitoring and control, Test Automation. Types of test tools.	12
	Total	60

Sr. No.	List of Practical
1	Study and implementation of class diagrams.
2	Study and implementation of Use Case Diagrams.
3	Study and implementation of Entity Relationship Diagrams.
4	Study and implementation of Sequence Diagrams.
5	Study and implementation of State Transition Diagrams.
6	Study and implementation of Data Flow Diagrams.

7	Study and implementation of Collaboration Diagrams.
8	Study and implementation of Activity Diagrams.
9	Study and implementation of Component & Deployment Diagrams.
10	Prepare a small project and submit SRS, design, coding and test plan.
11	The program reads an arbitrary number of temperatures (as integer numbers) within the range - 60°C … +60°C and prints their mean value. Design test cases for testing the program with the black-box strategy.

12	Let us study the following program:
	x=0; read(y);
	while (y > 100) { x=x+y; read(y); }
	if (y < 200) print(x) else print(y);
	a) Construct a control-flow graph for the program.
	b) Design test cases for reaching complete branch coverage over the program. Use as few test cases as possible.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks

1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1:Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

CO2: Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

CO3: Communicate effectively with a range of audiences.

CO4: Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

CO5: Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment and architectural diagrams to draw conclusions.

CO6: Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

C07: Demonstrate an ability to use the techniques and tools necessary for software engineering & testing practice.

12. References:

1. Software Engineering by Ian Somerville, 9th Edition, Pearson Education.
2. Software Engineering by Pankaj Jalote , Narosa Publication.
3. Software engineering, a practitioner's approach by Roger Pressman, 7th Edition, Tata McGraw Hill.
4. Software Engineering principles and practice by WS Jawadekar, Tata Mcgraw-hill.
5. Software Testing Foundations by Hans Schaefer, Andreas Spillner, Tilo Linz, 2nd Edition Shroff Publishers and Distributors.

6. Foundations of Software Testing by Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black.

COURSE STRUCTURE

1. **Title of the Course :** Java Programming
2. **Semester** : IV
3. **Course Code: For Theory:** BITSB404
   For Practical: BITPSB404
4. **Course Objective:**

   a. Understanding how to implement object-oriented designs with Java.
   b. The use of Java in a variety of technologies and on different platforms
   c. To design and program stand-alone Java applications.
   d. To learn how to design a graphical user interface (GUI) with Java AWT.
   e. To understand how to use Java APIs for program development.
   f. To learn how to use exception handling in Java applications.
   g. To learn Java generics and how to use the Java Collections API.
   h. Understand how to design applications with threads in Java.
   i. To learn how to read and write files in Java.

5. **Category of Course** : Skill Based
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITSB 404	Java Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction:** History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name **Data types:** primitive data types, Object Reference Types,	12

	Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.	
2	**Control Flow Statements:** The If…Else If…Else Statement, The Switch…Case Statement. **Iterations:** The While Loop, The Do … While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement **Classes:** Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading,Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.	12
3	**Inheritance:** Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. **Packages:** Creating Packages, Default Package, Importing Packages, Using A Package.	12
4	**Enumerations, Arrays:** Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector. **Multithreading:** the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. **Exceptions:** Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause **Byte streams:** reading console input, writing console output, reading file, writing file, writing binary data.	12
5	**Event Handling:** Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. **Abstract Window Toolkit:** Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames **Layouts:** Flow Layout, Grid Layout, Border Layout, Card Layout.	12
	Total	60

Sr. No.	List of Practical
1	Write a Java program that takes a number as input and prints its multiplication table upto 10.
2	Write a Java program to reverse a string.
3	Find the smallest and largest element from the array
4	Designed a class that demonstrates the use of constructor and destructor.
5	Write a java program to implement multiple inheritance
6	Create a package, Add the necessary classes and import the package in java class.
7	Write a java program to implement the vectors.
8	Write a java program to implement multithreading
9	Write a java program to open a file and display the contents in the console window.
10	Design a AWT program to print the factorial for an input value.
11	Design a calculator based on AWT application.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10

2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Use an integrated development environment to write, compile, run, and test simple Object-oriented Java programs

CO2: Use the Java programming language for various programming technologies.

CO3: Develop software in the Java programming language, (application)

CO4: knowledge of the structure and model of the Java programming language, (knowledge).

CO5: propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis).

12. References:

1. Core Java 8 for Beginners By Vaishali Shah, Sharnam Shah, 1th Edition, SPD,2015
2. Java: The Complete Reference By Herbert Schildt, 9th , McGraw Hill, Edtition, 2014
3. Core Java, Volume I: Fundamentals, By Hortsman, 9rd Edition, Pearson, 2019

COURSE STRUCTURE

1. **Title of the Course :** Analytical Reasoning
2. **Semester** : IV
3. **Course Code: For Theory:** BITAE405
4. **Course Objective:**
   a. To demonstrate capacities for quantitative and analytic reasoning.
   b. Use analytical thinking skills to evaluate information critically.
   c. Apply multiple modes of inquiry, including quantitative and qualitative analysis, to formulate, describe, evaluate, and solve problems.
   d. Use a wide range of disparate information and knowledge to draw inferences, test hypotheses, and make decisions.
5. **Category of Course** : Ability Enhancement
6. **Total Hours**: 60
7. **Total Credits**: 02 Credits (for Theory)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITAE405	Analytical Reasoning	5	-	2	-	2

Module	Detailed Content	Hours
1	**Numerical Ability** Some of the core concepts in maths and quant subjects are: • Percentages and its applications • Ratio and its applications • Algebra • Numbers and its applications • Geometry and its applications	12
2	**Data Interpretation Section** Problems related to organized and unorganized data are quite common in this section. Core topics are as follows: • Table • Bar	12

	• Pie Charts • Line graphs etc.	
3	**3. Critical Reasoning (and its numerous applications)** • Evaluation of Arguments • Recognition of Assumption • Cause and Effect • Deduction • Inference etc.	12
4	**4. Analytical Reasoning Section** • Blood Relations • Direction Sense • Matrix based Puzzles • Ranking Arrangements • Data Structures • Series • Coding-Decoding • Clocks and Calendars etc.	12
5	**5. Reading Comprehension** Questions will be based on the short easy to understand passages. **6. Verbal Ability** • Grammar • Vocabulary • Para jumbles • Sentence Correction • Spot the Error • Sentence Formation • Sentence Equivalence • Fill in the Blanks - Grammar Based etc**.**	12
	Total	60

9. **Evaluation Pattern:**

a. **Total Marks** : 100 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Students will identify the ideas, theories, or methods

Relevant to various topics, tasks, or problems.

CO2: Students will select appropriate relevant information, resources, or technologies necessary to address various topics, tasks, or problems.

CO3: Students will apply an appropriate method, strategy, or plan of action to perform a task, resolve a problem, or draw a logical conclusion.

CO4: Students will analyse information, resources, technologies, or data.

12. **References:**

1. A Modern Approach to Verbal & Non-Verbal Reasoning Book by R.S. Aggarwal.
2. Logical and Analytical Reasoning (Useful for All Competitive Exams) Book by A K Gupta
3. Analytical Reasoning by Raymond Murphy.

COURSE STRUCTURE

1. **Title of the Course :** Computer Graphics and Animation
2. **Semester** : IV
3. **Course Code: For Theory:** BITEL406
   For Practical: BITELP406
4. **Course Objective:**
   a. The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics.
   b. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.
   c. It provides the basics of Open application programming interface which allows students to develop programming skills in CG.
5. **Category of Course** : Elective Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITEL406	Computer Graphics and Animation	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to Computer Graphics:** Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays. **Scan conversion** – Digital Differential Analyzer (DDA) algorithm, Bresenhams' Line drawing algorithm**.** Bresenhams' method of Circle drawing, Midpoint Circle Algorithm, Midpoint	12

	Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components**.**	
2	**Two-Dimensional Transformations:** Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations. **Three-Dimensional Transformations:** Three-Dimensional Scaling, Three-Dimensional Shearing, Three-dimensional Rotation, Three-Dimensional Reflection, Three-dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections..	12
3	**Viewing in 3D:** Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. **Light:** Radiometry, Transport, Equation, Photometry **Color:** Colorimetry, Color Spaces, Chromatic Adaptation, Color Appearance	12
4	**Visible-Surface Determination:** Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods. **Plane Curves and Surfaces:** Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an	12

	Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces	
5	**Computer Animation**: Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects. **Image Manipulation and Storage:** What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.	12
	Total	60

Sr. No.	List of Practical
1	**Solve the following:** a. Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them. b. Draw a co-ordinate axis at the center of the screen
2	**Solve the following:** a. Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message. b. Draw a simple hut on the screen.
3	**Draw the following basic shapes in the center of the screen :** i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line
4	**Solve the following:** a. Develop the program for DDA Line drawing algorithm. b. Develop the program for Bresenham's Line drawing algorithm.
5	**Solve the following:** a. Develop the program for the mid-point circle drawing algorithm. b. Develop the program for the mid-point ellipse drawing algorithm.
6	**Solve the following:** a. Write a program to implement 2D scaling. b. Write a program to perform 2D translation
7	**Solve the following:** a. Perform 2D Rotation on a given object. b. Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. iii. Reflect about the line y = mx + c.
8	**Solve the following:**

	a. Write a program to implement Cohen-Sutherland clipping. b. Write a program to implement Liang - Barsky Line Clipping Algorithm
9	**Solve the following:** a. Write a program to fill a circle using Flood Fill Algorithm. b. Write a program to fill a circle using Boundary Fill Algorithm
10	**Solve the following:** a. Develop a simple text screen saver using graphics functions. b. Perform smiling face animation using graphic functions. c. Draw the moving car on the screen

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics

CO2: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CO3: Use of geometric transformations on graphics objects and their application in composite form.

CO4: Extract scene with different clipping methods and its transformation to graphics display device

12. References:

1. Computer Graphics - Principles and Practice J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes Pearson Education Second Edition
2. Steve Marschner, Peter Shirley Fundamentals of Computer Graphics CRC press Fourth Edition 2016
3. Computer, Baker Pearson Education Second Graphics Hearn
4. Principles of Interactive Computer Graphics William M. Newman and Robert F. Sproull Tata McGraw Hill Second

COURSE STRUCTURE

1. **Title of the Course:** Introduction to R and R Studio
2. **Semester**: IV
3. **Course Code: For Theory:** BITEL407
   For Practical: BITELP407
4. **Course Objective:**
   a. In this course learner will learn how to program in R and how to use R for effective data analysis.
   b. In this course learner will learn how to install and configure software necessary for a statistical programming environment and describe generic programming language concepts as they are implemented in a high-level statistical language.
   c. The course covers practical issues in computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.
5. **Category of Course**: Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITEL407	Introduction to R and R Studio	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction and Preliminaries:** The R environment, related software and documentation, R and statistics, R and Windows system, Using R interactively, an introductory session, getting help with functions and features, R commands, case sensitivity, recall and correction of previous commands, executing commands from or diverting output to a file, Data permanency and removing objects. **Simple manipulation, numbers and vectors:** Vectors and assignment, vector arithmetic, generating regular sequences, Logical vectors, missing values, character vectors, Index vectors, selecting and modifying subsets of a data set, Other types of objects	12
2	**Objects, their modes and attributes:**	12

	Intrinsic attributes, mode and length, Changing the length of an object, getting and setting attributes, The class of an object. **Ordered and Unordered factors:** The function tapply() and ragged arrays, Ordered factors.	
3	**Arrays and matrices:** Arrays, Array indexing, subsections of an array, Index matrices, The array() function, outer product of 2 arrays, generalized transpose of an array, Matrix facilities, forming partitioned matrices, cbind() and rbind(), The concatenation function, c(), with arrays, Frequency tables from factors. **Lists and data frames:** Lists, constructing and modifying lists, Data frames.	12
4	**Reading data from files:** The read.table() function, The scan() function, Accessing built-in datasets, Editing data. **Probability distribution:** R as a set of statistical tables, Examining the distribution of a set of data. **Grouping, loops and conditional execution:** Grouped expression, Control statements.	12
5	**Writing your own functions:** Simple examples, defining new binary operators, named arguments and defaults, the '…' argument, Assignments within functions, more advanced examples, Scope, Customizing the environment, Classes, generic functions and object orientation. **Graphical procedures:** High-level plotting commands, Low-level plotting commands, interacting with graphics, Using graphic parameters, Graphic parameters list, Device drivers, dynamic graphics.	12
	Total	60

Sr. No.	**List of Practical**
1.	Using R execute the basic commands.
2.	Using R, write a program to understand basic commands on various vector operations.
3.	Using R, write a program for understanding modes and attributes of objects.
4.	Using R, write a program using tapply() function, ragged array, ordered factor.
5.	Using R, create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
6.	Using R execute the basic commands of list and data frame.
7.	Using R, write a program to read data from a file through various functions.
8.	Using R, write a program to create statistical table and examining the set of data.

9.	Using R, write a program to create a customised environment, class and custom function.
10.	Using R, write a program to understand various graphic plotting commands.

9. Evaluation Pattern:

a. **Total Marks:** 150 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

On successful completion of this course, the Learner should be able to:

CO1: Understand basic concepts such as data type and index and use them in their work.

CO2: Demonstrate use of basic functions.

CO3: Conceptualize and create loops to solve different types of problems.
CO4: Create their own customized functions.
CO5: Construct tables and figures for descriptive statistics.
CO6: Learn to understand new data sets and functions.

12. **References:**

1. An introduction to R by W.N. Venables, D.M. Smith and the R core team, 2021.
2. Hands on Programming with R: Write Your Own Functions and Simulations by Garrett Gorlemund, 1st Edition, O'Reilly, 2017.
3. R for Everyone: Advanced Analytics and Graphics by Jared P. Lander, 2nd Edition, O'Reilly, 2017.

Semester - V

Semester - V				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC501	**Core Subject**	**Research in Computing**	**2**	**100**
BITCC502	**Core Subject**	**Linux System Administration**	**2**	**100**
BITCC503	**Core Subject**	**Internet of Things**	**2**	**100**
BITSB504	**Skill Based**	**ASP.Net with C#**	**2**	**100**
BITAE505	**Ability Enhancement**	**Enterprise Java**	**2**	**100**
BITEL506 **BITEL507**	**Elective**	1. **Data Warehousing and Mining** 2. **Artificial Intelligent**	**2**	**100**
BITCCP501	**Core Subject Practical**	**Research in Computing Practical**	**2**	**50**
BITCCP502	**Core Subject**	**Linux System Administration Practical**	**2**	**50**
BITCCP503	**Core Subject**	**Internet of Things Practical**	**2**	**50**
BITSBP504	**Skill Based**	**ASP.Net with C# Practical**	**2**	**50**
BITAEP505	**Ability Enhancement**	**Enterprise Java Practical**	**2**	**50**
BITELP506 **BITELP507**	**Elective**	**Elective Practical**	**2**	**50**
		Total Credits	**24**	**900**

COURSE STRUCTURE

1. **Title of the Course :** Research in Computing
2. **Semester** : V
3. **Course Code: For Theory:** BITCC501
   For Practical: BITCCP501
4. **Course Objective:**
   a. To be able to conduct business research with an understanding of all the latest theories.
   b. To develop the ability to explore research techniques used for solving any real world or innovate problem.
5. **Category of Course** : Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction**: Role of Business Research, Information Systems and Knowledge Management, Theory Building, Organization ethics and Issues	12
2	**Beginning Stages of Research Process**: Problem definition, Qualitative research tools, Secondary data research	12
3	**Research Methods and Data Collection:** Survey research, communicating with respondents, Observation methods, Experimental research	12
4	**Measurement Concepts, Sampling and Field work:** Levels of Scale measurement, attitude measurement, questionnaire design, sampling designs and procedures, determination of sample size	12
5	**Data Analysis and Presentation:** Editing and Coding, Basic Data Analysis, Univariate Statistical Analysis and Bivariate Statistical analysis and differences between two variables. Multivariate Statistical Analysis	12
	Total	60

Sr. No.	List of Practical
1	Import data from different data sources (from Excel, csv, mysql, sql server, oracle to R/Python/Excel)
2	Design a survey form for a given case study, collect the primary data and analyze it.
3	Perform testing of hypothesis using one sample t-test
4	Perform testing of hypothesis using chi-squared goodness-of-fit test.
5	Perform testing of hypothesis using one-way ANOVA.
6	Perform the Random sampling for the given data and analyse it
7	Perform linear regression for prediction
8	Perform multiple linear regression
9	Perform Logistic regression.
10	Perform the Stratified sampling for the given data and analyse it.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10

4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Solve real world problems with scientific approach
CO2: Develop analytical skills by applying scientific methods.
CO3: Recognize, understand and apply the language, theory and models of the field of business analytics
CO4: Foster an ability to critically analyse, synthesize and solve complex unstructured business Problems.
CO5: Understand and critically apply the concepts and methods of business analytics
CO6: identify model and solve decision problems in different settings
CO7: create viable solutions to decision making problems

12. References:

1. Business Research Methods, By William G.Zikmund, B.J Babin, J.C. Carr, Atanu Adhikari, M.Griffin, 8e, 2016
2. Business Analytics by Albright Winston, 5e, 2015
3. Research Methods for Business Students Fifth Edition, by Mark , 2011

COURSE STRUCTURE

1. **Title of the Course :** Linux System Administration
2. **Semester** : V
3. **Course Code: For Theory:** BITCC502
   For Practical: BITPCC502
4. **Course Objective:**
   a. To impart knowledge and skills on various practical and theoretical aspects of Linux operating system (OS) basics and Linux OS based server configuration, management and administration.
   b. This course introduces various tools and techniques commonly used by Linux programmers, system administrators and end users to achieve their day to day work in Linux environment.
   c. It is designed for computer students who have limited or no previous exposure to Linux.
5. **Category of Course** : Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT106	Introduction to Database Management System	5	3	2	2	4

Module	Detailed Content	Hours
1	Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps,	12

	Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories,Installing Software with Yum, Querying Software, Extracting Files from RPM Packages	
2	Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access 1214 Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	12
3	Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules,	12

	Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.	
4	Configuring DNS and DHCP:Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL	12
5	Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB. High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based	12

	Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File	
	Total	60

Sr. No.	**List of Practical**
1	Installation of RHEL 6.X Graphical User Interface and Command Line Interface and Processes a Exploring the Graphical Desktop b The Command Line Interface c Managing Processes
2	Storage Devices and Links, a Backup and Repository b Working with Storage Devices and Links
3	Working with RPMs Storage and Networking a Using Query Options b Extracting Files From RPMs c Configuring and Managing Storage d Connecting to the Network
4	Working with Users, Groups, and Permissions
5	Firewall and Cryptographic services a Securing Server with iptables b Setting Up Cryptographic Services
6	Configuring Server for File Sharing a Configuring NFS Server and Client b Configuring Samba c Configuring FTP

7	DNS, DHCP and Mail Server a Configuring DNS28 b Configuring DHCP c Setting Up a Mail Server
8	Web Server a Configuring Apache on Red Hat Enterprise Linux b Writing a Script to Monitor Activity on the Apache Web Server c Using the select Command
9	Shell Scripts and High-Availability Clustering a Writing Shell Scripts b Configuring Booting with GRUB c Configuring High Availability Clustering
10	Setting Up an Installation Server a Configuring Network Server as an Installation Server b Setting Up a TFTP and DHCP Server for PXE Boot

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**
   a. **Internal Assessment:**
      - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
      - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

   b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Understand the role and responsibilities of a Linux system administrator
CO2: Install and configure the Linux operating system
CO3: Feel comfortable navigating the command line interface to manipulate the system you are managing, including managing files, processes, users, software, system configurations, etc.
CO4: Perform backups and utilize software configuration management tools to be able to recreate systems efficiently.
CO5: Apply security best practices to perform basic server and network hardening.
CO6: Understand the networking protocols and network services that make the internet work (TCP/IP, DNS, HTTP, SMTP, etc).
CO7: Perform system and service health monitoring

12. References:

1. Red Hat Enterprise Linux 6 Administration by Sander van Vugt John -Wiley and Sons 2013

2. Red hat Linux Networking and System Administration Terry Collings and Kurt Wall Wiley 3rd

3. Linux Administration: A Beginner's Guide Wale Soyinka TMH Fifth Edition

COURSE STRUCTURE

1. **Title of the Course:** Internet of Things
2. **Semester**: V
3. **Course Code: For Theory:** BITCC503
   For Practical: BITCCP503
4. **Course Objective:**
   a. The aim of this course is to make students aware about 'Internet of Things'-IOT, which is an emerging technology through which all the manual process is to be converted in to system operated process and also integrates with the business.
   b. Learners will understand the concepts of Internet of Things and can able to build IoT applications.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC503	Internet of Things	5	3	2	2	4

Module	Detailed Content	Hours
1	**The Internet of Things:** An Overview: Flavour of the Internet of Things, the "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, who is Making the Internet of Things? **Design Principles for Connected Devices:** Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances. **Internet Principles:** Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP. **HTTPS:** Encrypted HTTP, Other Application Layer Protocols.	12
2	**Thinking About Prototyping:** Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production,	12

	Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. **Prototyping Embedded Devices:** Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	
3	**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. **Prototyping Online Components:** Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.	12
4	**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging **Business Models:** A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Start-up, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Start-ups.	12
5	**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.	12

	Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.	
	Total	60

Sr. No.	List of Practical
1.	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
2.	Displaying different LED patterns with Raspberry Pi.
3.	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.
4.	Raspberry Pi Based Oscilloscope.
5.	Controlling Raspberry Pi with WhatsApp.
6.	Setting up Wireless Access Point using Raspberry Pi.
7.	Fingerprint Sensor interfacing with Raspberry Pi.
8.	Raspberry Pi GPS Module Interfacing.
9.	IoT based Web Controlled Home Automation using Raspberry Pi.
10.	Visitor Monitoring with Raspberry Pi and Pi Camera.
11.	Interfacing Raspberry Pi with RFID.
12.	Building Google Assistant with Raspberry Pi.
13.	Installing Windows 10 IoT Core on Raspberry Pi.

9. Evaluation Pattern:

a. **Total Marks:** 150 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

On successful completion of this course, the Learner should be able to:

CO1: Understand the concepts of Internet of Things.

CO2: Analyse basic protocols in wireless sensor network.

CO3: Design IoT applications in different domain and be able to analyse their performance.

CO4: Implement basic IoT applications on embedded platform**.**

12. References:

1. Designing the Internet of Things by Adrian McEwen, Hakim Cassimally, 1st Edition, WILEY, 2014.
2. Internet of Things – Architecture and Design by Raj Kamal, 1st Edition, McGraw Hill, 2017.
3. Getting Started with the Internet of Things by Cuno Pfister, 6th Edition, O'Reilly, 2018.
4. Getting Started with Raspberry Pi by Matt Richardson and Shawn Wallace, 3rd Edition, SPD, 2016.

COURSE STRUCTURE

1. **Title of the Course :** ASP.Net with C#
2. **Semester** : V
3. **Course Code: For Theory:** BITSB504

   For Practical: BITSBP504
4. **Course Objective:**
   a. Learner will learn to develop Web applications that use three-tier architecture, session management, and object-oriented techniques.
   b. Learner will learn Concepts such as advanced CSS concepts.
   c. Learner will learn Web environments, authentication, and security will also be explored.
5. **Category of Course** : Skilled Base Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITSB504	ASP.Net with C#	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introducing .NET:** The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library**.** **The C# Language:** C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. **Types, Objects, and Namespaces:** The Basics About Classes, Building a Basic Class, Value Types and Reference Types,	12

	Understanding Namespaces and Assemblies, Advanced Class Programming.	
2	**Web Form Fundamentals:** Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. **Form Controls:** Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, **Website Navigation:** Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	12
3	**Error Handling, Logging, and Tracing:** Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing **State Management**: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options **Styles, Themes, and Master Pages**: Styles, Themes, Master Page Basics, Advanced Master Pages,	12
4	**ADO.NET Fundamentals:** Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. **Data Binding**: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls	12

	The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView	
5	**XML**: XML Explained, The XML Classes, XML Validation, XML Display and Transforms. **Security Fundamentals:** Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication. **ASP.NET AJAX**: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit	12
	Total	60

Sr. No.	List of Practical
1	**Working with basic C# and ASP .NET** a. Create an application that obtains four int values from the user and displays the product. b. Create an application to demonstrate string operations. c. Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered. d. Create an application to demonstrate following operations e. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. f. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number
2	**Working with Object Oriented C# and ASP .NET** a. Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion b. Create simple application to demonstrate use of following concepts

	i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces c. Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling
3	**Working with Web Forms and Controls** a. Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example : AutoPostBack) b. Demonstrate the use of Calendar control to perform following operations. a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendar dates c. Demonstrate the use of Treeview control perform following operations. a) Treeview control and datalist b) Treeview operations
4	**Working with Form Controls** A.Create a Registration form to demonstrate use of various Validation controls. B. Create Web Form to demonstrate use of Adrotator Control. C. Create Web Form to demonstrate use User Controls
5	**Working with Navigation, Beautification and Master page.** a. Create Web Form to demonstrate use of Website Navigation controls and Site Map. b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification. c. Create a web application to demonstrate various states of ASP.NET Pages
6	**Working with Database** a. Create a web application bind data in a multiline textbox by querying in another textbox. b. Create a web application to display records by using database. c. Demonstrate the use of Datalist link control.
7	**Working with Database** a. Create a web application to display Data binding using dropdownlist control.

	b. Create a web application for to display the phone no of an author using database. c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).
8	**Working with data controls** a. Create a web application to demonstrate various uses and properties of SqlDataSource. b. Create a web application to demonstrate data binding using DetailsView and FormView Control. c. Create a web application to display Using Disconnected Data Access and Data binding using Grandview.
9	**Working with GridView control** a. Create a web application to demonstrate use of GridView control template and GridView hyperlink. b. Create a web application to demonstrate use of GridView button column and GridView events. c. Create a web application to demonstrate GridView paging and Creating own table format using GridView.
10	**Working with AJAX and XML** a. Create a web application to demonstrate reading and writing operation with XML. b. Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties. c. Create a web application to demonstrate use of various Ajax controls.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	**Description**	**Marks**
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, students should be able to:

CO1: Apply three-tier architecture concepts and advanced database techniques in web applications

CO2: Use object-oriented techniques in Web programming

CO3: Develop rich interactive environments for the Web

CO4: Create sites that utilize data validation techniques and secure code

CO5: Build sites that use session management

12. **References:**

1. Beginning ASP.NET 4.5 in C# Matthew MacDonald Apress 2012
2. C# 2015 Anne Bohem and Joel Murach Murach Third 2016
3. Murach's ASP.NET 4.6 Web Programming in C#2015 Mary Delamater and Anne Bohem SPD Sixth 2016
4. ASP.NET 4.0 programming J. Kanjilal Tata McGraw-Hill 2011
5. Programming ASP.NET D.Esposito Microsoft Press (Dreamtech) 2011
6. Beginning Visual C# 2010 K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner Wrox (Wiley) 2010

COURSE STRUCTURE

1. **Title of the Course :** Enterprise Java
2. **Semester** : V
3. **Course Code: For Theory:** BITAE505
   For Practical: BITPAE505
4. **Course Objective:**
   a. Students will also be able to understand integrated development environment to create, debug and run multi-tier and enterprise-level applications.
   b. GUI based and web based applications using servlet, jsp.
   c. Understand client and server side programming using various JSP, JSTL, JPA and Hibernate technology
   d. Design and develop a Enterprise Java project from start to finish (Data storage and management).
5. **Category of Course** : Ability Enhancement
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Understanding Java EE:** WhatisanEnterpriseApplication? Whatisjavaenterpriseedition? JavaEETechnologies, JavaEEevolution, Glassfishserver **JavaEE Architecture,Serverand Containers:** TypesofSystemArchitecture, JavaEEServer, JavaEEContainers. **Introduction to Java Servlets:** TheNeedforDynamicContent, JavaServletTechnology, WhyServlets? WhatcanServletsdo? **Servlet API and Lifecycle:** JavaServletAPI, TheServletSkeleton, TheServletLifeCycle, ASimpleWelcomeServlet **WorkingwithServlets:** GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor. **Working with Databases:** WhatIsJDBC? JDBCArchitecture,	12

	AccessingDatabase, TheServletGUI and DatabaseExample	
2	**Request Dispatcher:** Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application. **COOKIES:** KindsofCookies, WhereCookiesAreUsed? CreatingCookiesUsingServlet,DynamicallyChangingtheColors ofAPage **SESSION:** WhatAreSessions? LifecycleofHttpSession, SessionTrackingWithServletAPI, AServlet Session Example **Workingwith Files:** UploadingFiles, CreatinganUploadFileApplication, DownloadingFiles, CreatingaDownloadFileApplication. **Workingwith Non-Blocking I/O:** CreatingaNonBlockingReadApplication, CreatingTheWeb Application, CreatingJavaClass, Creating Servlets, Retrieving The File, Creating index.jsp	12
3	**Introduction To Java ServerPages:** WhyuseJava ServerPages? DisadvantagesOfJSP, JSPv\sServlets, LifeCycleofaJSPPage, HowdoesaJSPfunction? HowdoesJSPexecute? AboutJava ServerPages **Getting Started With Java ServerPages:** Comments, JSPDocument, JSPElements, JSPGUIExample. **Action Elements:** IncludingotherFiles, ForwardingJSPPagetoAnotherPage, PassingParametersforotherActions, LoadingaJavabean. **Implicit Objects, Scope and El Expressions:** ImplicitObjects, CharacterQuotingConventions UnifiedExpressionLanguage[UnifiedEl], ExpressionLanguage. **Java Server Pages Standard Tag Libraries:** WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries	12
4	**Introduction To Enterprise Javabeans:** EnterpriseBeanArchitecture,BenefitsofEnterpriseBean, TypesofEnterpriseBean, AccessingEnterpriseBeans, EnterpriseBeanApplication,PackagingEnterpriseBeans **Working with Session Beans:** WhentouseSessionBeans? TypesofSessionBeans, RemoteandLocalInterfaces, AccessingInterfaces, LifecycleofEnterpriseBeans, PackagingEnterpriseBeans, Exampleof StatefulSessionBean, Example ofStatelessSessionBean, Example of SingletonSessionBeans. **Working with Message DrivenBeans:** LifecycleofaMessageDrivenBean,UsesofMessageDrivenBeans, TheMessage DrivenBeansExample. **Interceptors:** Request andInterceptor, Defining An Interceptor, AroundInvokeMethod, ApplyingInterceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. **Java Naming and Directory Interface**: What is Naming	12

	Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource, Definition in Java EE	
5	**Persistence, Object/Relational Mapping And JPA:** WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping, **Introduction to JavaPersistence API:** TheJavaPersistenceAPI, JPA, ORM, DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications. **Writing JPA Application:** ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. **Introduction to Hibernate:** WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? **WritingHibernateApplication:** ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication.	12
	Total	60

Sr. No.	List of Practical
1	Create a simple calculator application using servlet.
2	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
3	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
4	Create a servlet that uses Cookies to store the number of times a user has visited servlet.
5	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-

	radio button).
6	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC
7	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
8	Create a JSP application to demonstrate the use of JSTL.
9	Create a Currency Converter application using EJB.
10	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
11	Create simple JPA application to store and retrieve Book details.
12	Develop a Hibernate application to store and retrieve employee details in MySQL Database.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10

6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Create dynamic web pages, using Servlets and JSP.

CO2: Make a resusable software component, using Java Bean.

CO3: Understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB)

CO4: Map Java classes and object associations to relational database tables with Hibernate mapping files.

CO5: Develop Stateful, Stateless and Entity Beans.

CO6: Understand JSTL, JPA, Hibernet

References:

1. Java EE 7 For Beginners , By Sharanam Shah, Vaishali Shah,FIRST,SPD,2017
2. Advanced Java by Uttam Kumar Roy, Oxford Press, 2015
3. Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development, by Elder Moraes, FIRST, Packt, 2018

COURSE STRUCTURE

1. **Title of the Course :** Data warehousing and mining
2. **Semester** : V
3. **Course Code: For Theory:** BITEL506
   For Practical: BITPEL506
4. **Course Objective:**
   a. To identify the scope and essentiality of Data Warehousing and Mining.
   b. To analyze data, choose relevant models and algorithms for respective applications.
   c. To study spatial and web data mining.
   d. To develop research interest towards advances in data mining
5. **Category of Course** : Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to Data Warehouse and Dimensional modelling**: Introduction to Strategic Information, Need for Strategic Information, Features of Data Warehouse, Data warehouses versus Data Marts, Top-down versus Bottom-up approach. Data warehouse architecture, metadata, E-R modelling versus Dimensional Modelling, Information Package Diagram, STAR schema, STAR schema keys, Snowflake Schema, Fact Constellation Schema, Factless Fact tables, Update to the dimension tables, Aggregate fact tables.	12
2	**ETL Process and OLAP: Major steps in ETL process, Data extraction:** Techniques, Data transformation: Basic tasks, Major transformation types, Data Loading: Applying Data, OLTP Vs OLAP, OLAP definition, Dimensional Analysis, Hypercubes, OLAP operations: Drill down, Roll up, Slice, Dice and Rotation, OLAP models : MOLAP, ROLAP.	12
3	**Introduction to Data Mining, Data Exploration and**	12

	Preprocessing: Data Mining Task Primitives, Architecture, Techniques, KDD process, Issues in Data Mining, Applications of Data Mining, Data Exploration :Types of Attributes, Statistical Description of Data, Data Visualization, Data Preprocessing: Cleaning, Integration, Reduction: Attribute subset selection, Histograms, Clustering and Sampling, Data Transformation & Data Discretization: Normalization, Binning, Concept hierarchy generation, Concept Description: Attribute oriented Induction for Data Characterization.	
4	**Classification, Prediction and Clustering: Basic Concepts, Decision Tree using Information Gain, Induction**: Attribute Selection Measures, Tree pruning, Bayesian Classification: Naive Bayes, Classifier Rule - Based Classification: Using IFTHEN Rules for classification, Prediction: Simple linear regression, Multiple linear regression Model Evaluation & Selection: Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap, Clustering: Distance Measures, Partitioning Methods (k-Means, k-Medoids), Hierarchical Methods(Agglomerative, Divisive)	12
5	**Mining Frequent Patterns and Association Rules:** Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rule, Frequent Pattern Mining, Efficient and Scalable Frequent Item set Mining Methods: A priori Algorithm, Association Rule Generation, Improving the Efficiency of A priori, FP growth, Mining frequent Item sets using Vertical Data Format, Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules	12
	Total	60

Sr. No.	List of Practical
1	Build Data Warehouse and Explore WEKA
2	To perform various OLAP operations such as slice, dice, drilldown, rollup, pivot
3	Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
4	Demonstrate performing classification on data sets
5	Demonstrate performing clustering on data sets
6	Demonstrate performing Regression on data set
7	Credit Risk Assessment. Sample Programs using German Credit Data
8	Sample Programs using Hospital Management System
9	Create the Pivot table and Pivot chart using some existing data or create the new data.
19	Import the cube in access and create Pivot table and chart.

9. **Evaluation Pattern:**

a. **Total Marks** : 150 Marks (10 Point Grading)
b. **Passing Criteria** : 40 % (4 Grade Points)
c. **Marking Scheme** : 60:40:50 Pattern
   - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
   - 40 Marks - Internal Assessment (Passing = 16 Marks)
   - 50 Marks - Practical Assessment (Passing = 20 Marks)
d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**
   - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
   - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:
CO1: Understand Data Warehouse fundamentals, Data Mining Principles
CO2: Design data warehouse with dimensional modelling and apply OLAP operations.
CO3: Identify appropriate data mining algorithms to solve real world problems

CO4: Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining

CO5: Describe complex data types with respect to spatial and web mining. 6. Benefit the user experiences towards research and innovation.

12. **References:**

1. "Data Mining", Ian H. Witten, Eibe Frank and Mark A. Hall, 3rd Edition
2. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar.
3. "Data Mining Methods", R. Chattamvelli, 2nd Edition.

COURSE STRUCTURE

1. **Title of the Course :** Artificial Intelligence
2. **Semester** : V
3. **Course Code: For Theory:** BITEL506
   For Practical: BITPEL506
4. **Course Objective:**
   a. To explore the applied branches of artificial intelligence
   b. To enable the student to understand applications of artificial intelligence
   c. To enable the student to solve the problem aligned with derived branches of artificial intelligence
5. **Category of Course** : Elective
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT306	Geographical Information System	5	3	2	2	4

Module	Detailed Content	Hours
1	**Review of AI:** History, foundation and Applications **Expert System and Applications:** Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools	12
2	**Probability Theory:** joint probability, conditional probability, Bayes's theorem, probabilities in rules and facts of rule based system, cumulative probabilities, rule based system and Bayesian method **Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets, Fuzzy set operations, Types of Member ship Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic	12
3	**Machine Learning Paradigms:** Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based	12

	reasoning and learning. **Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feedforward networks, multi-layer feedforward networks, radial basis function networks, design issues of artificial neural networks and recurrent networks	
4	**Evolutionary Computation:** Soft computing, genetic algorithms, genetic programming concepts, evolutionary programming, swarm intelligence, ant colony paradigm, particle swarm optimization and applications of evolutionary algorithms. **Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications	12
5	**Advanced Knowledge Representation Techniques:** Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, semantic web. **Natural Language Processing:** Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary	12
	Total	60

List of Practical	
	List of Practical: 10 practicals covering the entire syllabus must be performed. The detailed list of practical will be circulated later in the official workshop.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Be able to use probability and concept of fuzzy sets for solving AI based problems

CO2: Be able to understand the fundamentals concepts of expert system and its applications.

CO3: Be able to understand the applications of Machine Learning. The learner can also apply fuzzy system for solving problems.

CO4: A student can use knowledge representation techniques in natural language processing.

CO5: Student will be able to apply to understand the applications of genetic algorithms in different problems related to artificial intelligence.

12. References:

1. Artificial Intelligence by Saroj Kaushik, 1st, 2019
2. Artificial Intelligence: A Modern Approach by A. Russel, Peter Norvig, 1st, 2019
3. Artificial Intelligence by Elaine Rich,Kevin Knight,Shivashankar B. Nair, 3nd Edition.2019

Semester - VI

Semester - VI				
Course Code	**Course Type**	**Course Title**	**Credits**	**Marks**
BITCC601	**Core Subject**	**Software Project Management**	**2**	**100**
BITCC602	**Core Subject**	**Business Intelligence**	**2**	**100**
BITCC603	**Core Subject**	**Robotics Process Automation**	**2**	**100**
BITSB604	**Skill Based**	**Mobile Application Development**	**2**	**100**
BITAE605	**Ability Enhancement**	**Security in Computing**	**2**	**100**
BITEL606 **BITEL607**	**Elective**	1. **Data Science** 2. **Soft Computing**	**2**	**100**
BITCCP601	**Core Subject Practical**	**Project Implementation**	**2**	**100**
BITCCP602	**Core Subject**	**Business Intelligence Practical**	**2**	**50**
BITCCP603	**Core Subject**	**Robotics Process Automation Practical**	**2**	**50**
BITSBP604	**Skill Based**	**Mobile Application Development Practical**	**2**	**50**
BITAEP605	**Ability Enhancement**	**Security in Computing Practical**	**2**	**50**
BITELP606 **BITELP607**	**Elective**	**Elective Practical**	**2**	**50**
		Total Credits	**24**	**950**

COURSE STRUCTURE

1. **Title of the Course :** Software Project Management
2. **Semester** : VI
3. **Course Code: For Theory:** BITCC601

   For Practical: BITCCP601
4. **Course Objective:**

   a. Understand the fundamental principles of Software Project management & will also have a good knowledge of responsibilities of project manager and how to handle these.
   b. Be familiar with the different methods and techniques used for project management. To study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
   c. To understand the issues and challenges faced while doing the Software project Management and will also be able to understand why majority of the software projects fails and how that failure probability can be reduced effectively.
   d. Deliver successful software projects that support organization's strategic goals.
   e. Match organizational needs to the most effective software development model
   f. Plan and manage projects at each stage of the software development life cycle (SDLC)
   g. Create project plans that address real-world management challenges.
   h. Develop the skills for tracking and controlling software deliverables.
5. **Category of Course**: Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC 501	Software Project Management	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to Software Project Management:** Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management:** Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. **An Overview of Project Planning:** Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning	12
2	**Selection of an Appropriate Project Approach:** Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model. **Software Effort Estimation:** Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom- up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model,	12

	Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	
3	**Activity Planning:** Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks. **Risk Management:** Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts. **Resource Allocation:** Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	12
4	**Monitoring and Control:** Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). **Managing Contracts:** Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. **Managing People in Software Environments:** Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	12
5	**Working in Teams:** Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. **Software Quality:** Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software	12

	Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans. **Project Closeout:** Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	
	Total	60

Sr. No.	List of Practical
1	**Create 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.
2	**Assign Resources to Project :** ▪ Define project calendar. ▪ Define project resources. ▪ Specify resource type and resource rates. ▪ Assign resources against each task. ▪ Baseline the project plans.
3	**Execute and Monitor 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.
4	**Generate Dashboard and Reports :** ▪ Dashboard a) Project Overview b) Cost Overview c) Upcoming Tasks ▪ Resource Reports a) Over-allocated Resources b) Resource Overview

5	▪ **Cost Reports** a) Earned Value Report b) Resource Cost Overview c) Task Cost Overview
6	▪ **Progress Reports** a) Critical Tasks b) Milestone Report c) Slipping Tasks

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10

6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Project Dissertation (Black book)	Oral	Total
2 Hours 30 min per batch	30 Marks	20 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Understand project characteristics and various stages of a project.

CO2: Understand the conceptual clarity about project organization and feasibility analyses- Market, Technical, Financial and Economic.

CO3: Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.

CO4: Apply the risk management plan and analyse the role of stakeholders.

CO5: Understand the contract management, Project Procurement, Service level Agreements and productivity.

CO6: Understand the project closeout process and documentation logging.

12. References:

1. Software Project Management by Bob Hughes, Mike Cotterell, Rajib Mall , 6th Edition, McGraw-Hill, 2018
2. Project Management and Tools & Technologies – An overview by Shailesh Mehta , 1st Edition , SPD , 2017
3. Software Project Management by Walker Royce, Pearson, 2005

COURSE STRUCTURE

1. **Title of the Course :** Business Intelligence
2. **Semester** : V
3. **Course Code: For Theory:** BITCC602

   For Practical: BITCCP602
4. **Course Objective:**
   a. Data extraction: Investigate data to establish new relationships and patterns
   b. Predictive Analytic and Predictive Modelling: Analyse the correlation between different variables
   c. Logistic Regression: Analyze the possibility of default and generate customer records
   d. Problem analysis: Understand and explore problems in business
   e. Data interpretation: Use tools such as Excel and open source to interpret data
   f. Problem-solving: Use analytics to solve business problems

5. **Category of Course** : Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC602	Business Intelligence	5	3	2	2	4

Module	Detailed Content	Hours
1	**Business intelligence:** Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence **Decision support systems**: Definition of system, Representation of the decision-making process, Evolution of information	12

	systems, Definition of decision support system, Development of a decision support system	
2	**Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models **Data mining**: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	12
3	**Classification:** Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines **Clustering:** Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	12
4	**Business intelligence applications:** Marketing models: Relational marketing, Sales force management, And Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. **Data envelopment analysis:** Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	12
5	**Knowledge Management:** Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management **Artificial Intelligence and Expert Systems:** Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	12
	Total	60

Sr. No.	List of Practical
1	Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.
4	A.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the data warehouse.
5	a. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis
6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7	Perform the data classification using classification algorithm.
8	Perform the data clustering using clustering algorithm
9	Perform the Linear regression on the given data warehouse data.
10	Perform the logistic regression on the given data warehouse data.

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Describe the concepts and components of Business Intelligence (BI).

CO2: Critically evaluate use of BI for supporting decision making in an organisation.

CO3: Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of online analytical processing (OLAP)).

CO4: Understand and design the technological architecture that underpins BI systems.

CO5: Plan the implementation of a BI system.

12. **References:**

1. Business Intelligence Data Mining and Optimization for Decision Making (Carlo Vercellis) Wiley 1st 2009
2. Decision support and Business Intelligence Systems (Efraim Turban, Ramesh Sharda, Dursun Delen) Pearson 9th 2011
3. Fundamentals of Business Intelligence (Grossmann W, Rinderle-Ma)

COURSE STRUCTURE

1. **Title of the Course :** Robotic Process Automation
2. **Semester** : VI
3. **Course Code: For Theory:** BITCC603
   For Practical: BITPCC603
4. **Course Objective:**
   - To make the students aware about the automation today in the industry.
   - To make the students aware about the tools used for automation.
   - To help the students automate a complete process
5. **Category of Course** : Core Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BIT106	Introduction to Database Management System	5	3	2	2	4

Module	Detailed Content	Hours
1	Robotic Process Automation: Scope and techniques of automation, About UiPath Record and Play: UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder.	12
2	Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example)	12

3	Taking Control of the Controls : Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points Tame that Application with Plugins and Extensions: Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, 12 CO336 Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight	12
4	Handling User Events and Assistant Bots: What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger ,Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting	12
5	Managing and Maintaining the Code: Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files and examples of a config file, Integrating a TFS server Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates	12
	Total	60

Sr. No.	**List of Practical**
1	Downloading and installing UiPath Studio
2	UiPath Studio different types of projects
3	The user interface –Record and play - How to Emptying the trash folder in Gmail
4	- How to Emptying Recycle Bin

5	How to use a Sequence, With input dialog and message box
6	How to use a Flowchart,
7	How to use Control Flow and various loops, While activity, do while activity,
8	How to use for activity, decision making
9	Step-by-step example using Sequence and Flowchart
10	Step-by-step example using Sequence and Control flow
11	Building a data table using data scraping (dynamically)
12	File operation with step-by-step example
13	Reading an Excel file and creating a data table by using data from the Excel file

9. **Evaluation Pattern:**
   a. **Total Marks** : 150 Marks (10 Point Grading)
   b. **Passing Criteria** : 40 % (4 Grade Points)
   c. **Marking Scheme** : 60:40:50 Pattern
      - 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
      - 40 Marks - Internal Assessment (Passing = 16 Marks)
      - 50 Marks - Practical Assessment (Passing = 20 Marks)
   d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**
   a. **Internal Assessment:**
      - Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
      - Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

   b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10

4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

After completing the course, a learner will be able to:

CO1: Understand the mechanism of business process and can provide the solution in an optimize way.

CO2: Understand the features use for interacting with database plugins.

CO3: Use the plug-ins and other controls used for process automation.

CO4: Use and handle the different events, debugging and managing the errors.

CO5: Test and deploy the automated process.

12. References:

1. Learning Robotic Process Automation by Alok Mani -Tripathi Packt 1st 2018

2. Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation Srikanth Merianda Createspace Independent Publishing 1st 2018

3. The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement Rpa in an Organization Kelly Wibbenmeyer iUniverse 1st 2018

COURSE STRUCTURE

1. **Title of the Course :** Mobile Application Development
2. **Semester** : VI
3. **Course Code: For Theory:** BITSB604
   For Practical: BITPSB604
4. **Course Objective:**

   a. To understanding of the fundamentals of Android operating systems
   b. To demonstrate their skills of using Android software development tools
   c. To ability to develop software with reasonable complexity on mobile platform
   d. To demonstrate their ability to deploy software to mobile devices
   e. To demonstrate their ability to debug programs running on mobile devices

5. **Category of Course** : Skill Based
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITSB 404	Java Programming	5	3	2	2	4

Module	Detailed Content	Hours
1	**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. **Android application components –** Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes. **Android Application Lifecycle** – Activities, Activity lifecycle, activity states, monitoring state changes.	12
2	**Android User Interface: Measurements** – Device and pixel density independent measuring units.	12

	Layouts – Linear, Relative, Grid and Table Layouts. **User Interface (UI) Components –** Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. **Event Handling** – Handling clicks or changes of various UI components. **Fragments –** Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities	
3	**Intents and Broadcasts: Intent** – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS. **Broadcast Receivers** – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity. **Notifications** – Creating and Displaying notifications, Displaying Toasts.	12
4	**Persistent Storage: Files** – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference	12
5	**Database** – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)	12
	Total	60

Sr. No.	List of Practical
1	Introduction to Android Studio IDE, Application Fundamentals Simple "Hello World" program.
2	Android Resources: (Color, Theme, String, Drawable, Dimension, Image)
3	Programming Activities and fragments: Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments.
4	Programming Activities and fragments: Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.
5	Programming UI elements: AppBar, Fragments, UI Components
6	Programming menus, dialog,dialog fragments
7	Programs on Intents, Events, Listeners and Adapters: The Android Intent Class, Using Events and Event Listeners
8	Programs on Services, notification and broadcast receivers
9	Database Programming with SQLite
10	Programming threads, handles and asynchronized programs

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Recognizes the concept of application development for mobile devices.

CO2: Understands the basic technologies used by the Android platform.
CO3: Recognizes and uses Android Environment Emulator and Application life cycle.
CO4: Understanding and uses Android Selection Widgets

12. **References:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
3. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

COURSE STRUCTURE

1. **Title of the Course :** Security in Computing
2. **Semester** : VI
3. **Course Code: For Theory: BITAE605**
   For Practical: BITAEP605
4. **Course Objective:**

The learning objectives of this course are:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.

5. **Category of Course** : Ability Enhancement
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITAE605	Security in Computing	5	3	2	2	4

Module	Detailed Content	Hours
1	**Information Security Overview:** The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Défense Models, Zones of Trust, Best Practices for Network Défense.	12
2	**Authentication and Authorization:** Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography,	12

	Public Key Infrastructure. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring	
3	**Secure Network Design:** Introduction to Secure Network Design, Performance, Availability, Security. Network Device Security: Switch and Router Basics, Network Hardening. Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. Wireless Network Security: Radio Frequency Security Basics, DataLink Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways	12
4	**Intrusion Detection and Prevention Systems:** IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	12
5	**Virtual Machines and Cloud Computing:** Virtual Machines, Cloud Computing. Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security. Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion.	12
	Total	60

Sr. No.	**List of Practical**
1	Configure Routers: -

	a.OSPF MD5 authentication. b NTP. c to log messages to the syslog server. d to support SSH connections.
2	Configure AAA Authentication a Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA b Verify local AAA authentication from the Router console and the PC-A client
3	Configuring Extended ACLs a Configure, Apply and Verify an Extended Numbered ACL
4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs a Verify connectivity among devices before firewall configuration. b Use ACLs to ensure remote access to the routers is available only from management station PC-C. c Configure ACLs on to mitigate attacks. d Configuring IPv6 ACLs
5	Configuring a Zone-Based Policy Firewall
6	Configure IOS Intrusion Prevention System (IPS) Using the CLI a Enable IOS IPS. b Modify an IPS signature
7	Layer 2 Security a Assign the Central switch as the root bridge. b Secure spanning-tree parameters to prevent STP manipulation attacks. c Enable port security to prevent CAM table overflow attacks.
8	Layer 2 VLAN Security
9	Configure and Verify a Site-to-Site IPsec VPN Using CLI
10	Configuring ASA Basic Settings and Firewall Using CLI a Configure basic ASA settings and interface security levels using CLI b Configure routing, address translation, and inspection policy using CLI c Configure DHCP, AAA, and SSH d Configure a DMZ, Static NAT, and ACLs

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. **Paper Pattern:**

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	**Description**	**Marks**
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. **Course Outcome:**

Upon successful completion of this course, Learner should be able to:

CO1: The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.

CO2: The learner will understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

CO3: The learner will be able to examine secure software development practices.

CO4: The learner will understand principles of web security.

CO5: The learner will be able to incorporate approaches for incident analysis and response.

CO6: The learner will be able to incorporate approaches for risk management and best practices.

CO7: The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.

CO8: The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

CO9: The learner will gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.

12. **References:**

1. The Complete Reference Information Security Mark Rhodes-Ousley McGraw-Hill 2nd 2013
2. Essential Cybersecurity Science Josiah Dykstra O'Reilly Fifth 2017
3. Principles of Computer Security: CompTIA Security+ and Beyond Wm.Arthur Conklin, Greg White McGraw Hill Second 2010

COURSE STRUCTURE

1. **Title of the Course :** Data Science
2. **Semester** : VI
3. **Course Code: For Theory:** BITEL606
   For Practical: BITELP606
4. **Course Objective:**

   a. To explain idea of data analysis techniques and quantitative modeling for the solution of real world business problems.
   b. To report findings of analysis and effectively present them using data visualization techniques.
   c. To demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
   d. To provide insights about the roles of a Data Scientist, such as a developer, an analyst, a statistical expert etc.
   e. To understand techniques and tools for transformation of data, Data Mining, Data formats, Machine Learning Algorithms, Data Visualization and Optimization.

5. **Category of Course**: Elective Course
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITEL606	Data Science	5	3	2	2	4

Module	Detailed Content	Hours
1	**Data Science Technology Stack:** Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools ,Spark, Mesos, Akka , Cassandra, Kafka, Elastic Search, R ,Scala, Python, MQTT, The Future **Layered Framework:** Definition of Data Science Framework, Cross- Industry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top	12

	Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering. **Business Layer:** Business Layer, Engineering a Practical Business Layer. **Utility Layer:** Basic Utility Design, Engineering a Practical Utility Layer.	
2	**Three Management Layers:** Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process. **Retrieve Superstep :** Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, Actionable Business Knowledge from Data Lakes, Engineering a Practical Retrieve Superstep, Connecting to Other Data Sources.	12
3	**Assess Superstep:** Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep.	12
4	**Process Superstep :** Data Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process, Data Science. **Transform Superstep :** Transform Superstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test.	12
5	**Transform Superstep:** Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Linear Regression, Logistic Regression, Clustering Techniques, ANOVA, Principal Component Analysis (PCA), Decision Trees, Support Vector Machines, Networks, Clusters, and Grids, Data Mining, Pattern Recognition, Machine Learning, Bagging Data,Random Forests, Computer Vision (CV) , Natural Language Processing (NLP), Neural Networks, TensorFlow. **Organize and Report Supersteps :** Organize Superstep, Report Superstep, Graphics, Pictures, Showing the Difference	12
	Total	60

Sr. No.	List of Practical
1	Creating Data Model using Cassandra.
2	Conversion from different formats to HOURS format. a. Text delimited csv format. b. XML c. JSON

	d. MySQL Database e. Picture (JPEG) f. Video g. Audio
3	Utilities and Auditing
4	Retrieving Data
5	Assessing Data
6	Processing Data
7	Transforming Data
8	Organizing Data
9	Generating Reports
10	Data Visualization with Power BI

9. Evaluation Pattern:

a. **Total Marks** : 150 Marks (10 Point Grading)

b. **Passing Criteria** : 40 % (4 Grade Points)

c. **Marking Scheme** : 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)
- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books** : Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination :**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10

3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Develop relevant programming abilities.

CO2: Demonstrate proficiency with statistical analysis of data.

CO3: Develop the ability to build and assess data-based models.

CO4: Execute statistical analyses with professional statistical software.

CO5: Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

CO6: Formulate simple algorithms to solve problems, and can code them in a high-level language appropriate for data science work (e.g., Python, SQL, R, Java).

CO7: Integrate data from disparate sources, can transform data from one format to another, and can program data management in relational databases.

12. References:

1. Practical Data Scienceby Andreas François Vermeulen , APress, 2018.
2. Principles of Data Science by Sinan Ozdemir, PACKT, 2016.
3. Data Science from Scratch by Joel Grus, O'Reilly, 2015.
4. Data Science from Scratch first Principle in python by Joel Grus, Shroff Publishers, 2017.
5. Experimental Design in Data science with Least Resources by N C Das, Shroff Publishers, 2018.

COURSE STRUCTURE

1. **Title of the Course:** Soft Computing
2. **Semester**: VI
3. **Course Code: For Theory:** BITEL607
   For Practical: BITELP607
4. **Course Objective:**

   This course aims
   a. To introduce learners to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing-based solutions for real-world and engineering problems.
   b. To introduce learners to fuzzy systems, fuzzy logic and its applications.
   c. To explain the learners about Artificial Neural Networks and various categories of ANN.
   d. To explain the learners about Genetic Algorithm and various categories of it.
5. **Category of Course**: Core
6. **Total Hours**: 60
7. **Total Credits**: 04 Credits (02 Credits for Theory & 02 Credits for Practical)
8. **Modules:**

Course Code	Course Name	Teaching Scheme (Hours /Week)		Credits Assigned		
		Theory	Practical/ Tutorial	Theory	Practical/ Tutorial	Total
BITCC601	Soft Computing	5	3	2	2	4

Module	Detailed Content	Hours
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. **Introduction to Fuzzy Systems:** Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic.	12
2	**Fuzzy Systems:** Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification. **Fuzzy Backpropagation Networks:** LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.	12
3	**Neural Networks:** What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back	12

	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.	
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, Multilevel Optimization.	12
5	**GA based Backpropagation Networks:** GA based Weight Determination, K - factor determination in Columns. **Hybrid Systems:** Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.	12
	Total	60

Sr. No.	**List of Practical**
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 autocorrelator by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, - 1, 1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).
4.	Train the hetrocorrelator using multiple training encoding strategy for given patterns: A1=(000111001), B1=(010000111), A2=(111001110) B2=(100000001), A3=(110110101) B3(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.

9. Evaluation Pattern:

a. **Total Marks:** 150 Marks (10 Point Grading)

b. **Passing Criteria**: 40 % (4 Grade Points)

c. **Marking Scheme:** 60:40:50 Pattern

- 60 Marks - Written/Semester End Exam (Passing = 24 Marks)
- 40 Marks - Internal Assessment (Passing = 16 Marks)

- 50 Marks - Practical Assessment (Passing = 20 Marks)

d. **Mode of Evaluation of Answer-books:** Online/Offline

10. Paper Pattern:

a. **Internal Assessment:**

- Assessment consists of a class tests of 20 marks. The class test is to be conducted when approx. 40% syllabus is completed. Test will be of one hour.
- Students have to submit assignment after completion of each module which will carry 15 marks and 5 marks are for attendance.

b. **Semester End Theory Examination:**

Question No.	Description	Marks
1	Objectives or Short Answers (Covering All Modules)	10
2	Answer any two Questions (Descriptive based on module 1)	10
3	Answer any two Questions (Descriptive based on module 2)	10
4	Answer any two Questions (Descriptive based on module 3)	10
5	Answer any two Questions (Descriptive based on module 4)	10
6	Answer any two Questions (Descriptive based on module 5)	10

Note: Q.2 to Q.6 will include total 4 sub questions having 5 marks each.

c. **Semester End Practical Examination:**

Exam Duration (in Hours)	Practical + Oral	Journal	Total
2 Hours 30 min per batch	45 Marks	05 Marks	50 Marks

11. Course Outcome:

On successful completion of this course, the Learner should be able to:

CO1: Understand soft computing techniques and their role in problem solving.

CO2: Conceptualize and parameterize various problems to be solved through basic soft computing techniques.

CO3: Analyse and integrate various soft computing techniques in order to solve problems effectively and efficiently.

12. References:

1. Neural Networks, Fuzzy Logic & Genetic Algorithm: Synthesis and Applications by S. Rajasekaran & G. A. Vijayalakshmi Pai, Phi, 2003.
2. Soft Computing: Methodologies and Applications by Hoffmann, F., Koeppen, M., Klawonn, F. & Roy, R., Springer, 2005.
3. Principles of Soft Computing by S. N. Sivanandam & S.N. Deepa, Wiley, 2007.
4. Genetic Algorithms by David E. Goldberg, Pearson Education India, 2006.

5. Soft Computing and Its Applications by Rafik Aziz, O. Aliev, R. R. Aliev, World Scientific, 2001.
6. Artificial Neural Networks by B. Yagnanarayana, PHI, 2009.
7. Neural Networks and Learning Machines by Simon O. Haykin, 3rd Edition, Prentice Hall, 2009.