Revised Syllabus for
Bachelor in Computer Applications (BCA)
Choice Based Credit System
(3 Years Degree Course)

Date of Approval of 2nd Rev. by BOS: 28th September, 2018
Date of Approval by School Board: 25th October, 2018
Date of Approval by 35th Acad. Council: 26th November, 2018
[as per CBCS Regulations(UG) of Mizoram University]

(*To be effective from July, 2019*)

MIZORAM UNIVERSITY
Revised Syllabus for 3 Years Degree
Bachelor of Computer Applications (BCA)
(*To be effective from July 2019*)

Introduction

Objective:

The knowledge and skills required to plan, design and build complex application software system, which are very much needed in all industry sectors including business, health, education and the arts. The basic objective of BCA Course is to provide young minds with the required knowledge and necessary skills to get rewarding careers into the ever changing world of Information technology.

Job Opportunities:

The graduates could begin their career as Junior Programmer and then matured as Sr. Programmer, System Analysts, etc. They may seek entrepreneurial roles in the computer world as independent business owners, software authors, consultants, or suppliers of systems and equipments. Career opportunities exist in such areas as management, software and hardware Industries, technical writing, IT Training Institutes, Software consultancy & Technical Support.

Application areas include transaction processing (such as order processing, airline/railway/banking), accounting functions, decision support and data communications.

The BCA programme will be a full time three years (six semesters) Bachelor's Degree in Computer Applications. The institutes should organize training programme/project in the final year by interacting with Software companies and Consultancy within in and outside the state.

Rules and Regulations (Revised)

Short Title and Introduction

These regulations shall be called "Regulations for Bachelor of Computer Applications (BCA) Program", as approved by the **35th** Academic Council of Mizoram University held on 26th November 2018. These shall come into force from the Academic year 2019. These regulations are subject to modifications as deemed whenever necessary by the Academic Council of the Mizoram University.

1. **Program**: The Bachelor of Computer Applications (BCA) Program shall consist of 6 (six) semesters. While pursuing the course, the students are not allowed to pursue any other program within or outside the University.

2. **Duration**: The minimum duration of the BCA Program is 3 (Three) years. The students are required to complete the BCA Course within a maximum of 5 years (10 semesters) failing which they shall have to seek fresh admission.

3. **Medium of Instruction**: English is the only medium of instructions.

4. **Eligibility of Admission** : A candidate seeking admission to the BCA Course must have passed 10+2 (any stream) securing not less than 50% marks in aggregate (5% relaxation to ST/SC candidates) from the Central Board of Secondary Education or any other equivalent examination recognized by the Mizoram University *preferably* with Mathematics as one of compulsory or optional course, or any other vocational course related to the computer stream having either Computer Science or Computer Engineering as compulsory/optional course.

5. **Commencement of the Course**: As notified by the Mizoram University.

6. **Working days in Academic Year**: Each semester shall consist not less than 90 effective teaching days. This will be as notified by the Mizoram University.

7. **Eligibility for appearing at the University Examination**: Candidates having attendance less than 75% in any semester both in theory and practical courses *separately* are not eligible to appear in that semester examination. A maximum of 15% relaxation in attendance shall be considered as per the Mizoram University rules.

8. **Examination :**

   a. Candidate shall be allowed to appear in any course (Internal / External) as many as possible including regular chance, within the time frame. No Candidate shall be allowed to appear in any course beyond 10 (ten) Semesters of his/her admission.

   b. The pass marks for each course is 40% both in the Internal and End-semester Examinations, separately. For clearing a semester the minimum SGPA is 5.0 and similarly, for clearing the course the overall CGPA required is 5.0.

   c. A minimum of 5 SGPA (Semester Grade Point Average, defined at Point #11) is required to clear/pass a semester. Similarly, a minimum of 5 CGPA required to clear the BCA program.

   f. The duration of end semester examination will be of 3 hours.

9. Re-evaluation will be allowed as per Mizoram University regulations.

10. **Grading System:**

   Based on overall performance of the student in each semester, the Grade shall be awarded on a scale of Ten (10) point grade as per following scheme:

Marks Range (Out of 100)	Grade	Grade Points	Description of Performance
100-91	A+	10	Outstanding
90-81	A	9	Excellent
80-71	B+	8	Very Good
70-61	B	7	Good
60-50	C+	6	Average
49-40	C	5	Below Average
< 40	Not to be considered for Awarding grades		

At the end of each end-semester examination, a student shall be awarded a Semester Grade Point Average (SGPA) which shall be calculated as:

$$SGPA = \sum_{i=1}^{n} c_i g_i \bigg/ \sum_{i=1}^{n} c_i$$

where, n = Total number of papers in the Semester.

C_i = Number of credits in the ith paper.

g_i = Grade Points earned in the ith paper.

At the end of BCA programme, a student shall be awarded a Cumulative Grade Point Average (CGPA) which shall be calculated as

$$CGPA = \frac{\sum_{i=1}^{m} C_i S_i}{\sum_{i=1}^{m} C_i}$$

where, m = Total number of Semesters in the programme.

S_i = SGPA in the ith Semester.

C_i = Total number of credits in the ith Semester.

If the comparison of the performance of a student of Mizoram University with those from the other Universities/Institute, if required, the following formula for converting CGPA to percentage of marks shall be used:

Equivalent Percentage= 10 X CGPA-5, for CGPA up to 9.

Equivalent Percentage= 15 X CGPA-50, for CGPA above 9.

11. Award of Division:

On the basis of the CGPA, the result of each student shall be declared as follows:

CGPA 8.0 and above	Passed in First Division with Distinction.
CGPA 7.0 – 7.9	Passed in First Division.
CGPA 6 and 6.9	Passed in Second Division.
CGPA 5 – 5.9	Passed in Third Division
CGPA Below 5	Failed.

12. Award of Rank:

Rank of a student will be awarded as per Mizoram University rules.

13. Re-examinations/Improvement facilities

This will be as per Mizoram University existing regulations.

14. Assessment

Theory: For each Theory paper, there will be 25/75% assessment for Internal/External examinations, respectively. In each semester examination, out of total 100 marks, Theory question paper will be set for 75 marks and remaining 25 marks will be set for internal examinations. The project in the final semester will be assessed for total marks of 300 but will be converted into a scale of 100 point. Internal assessment includes Terminals, Practical skills, Assignment, Presentations, Performances, Attendance etc.

Practical : The marks distribution for Practical Papers and the breakup of marks for the Internal and External Exam will be as under:

Internal Assessment(Practical)	
Internal Test	15 marks
Practical skills/performances etc.	10 marks
Total	25 marks
External(Practical)	
Laboratory Record	10 marks
Viva Voce	15 marks
Program Development and Execution	50 marks
Total	75 marks

Teaching Scheme(per week) in each Paper		
Theory(hrs)	**Demonstration(hrs)**	**Practical(hrs)**
3	1	4

15. Revision of Syllabus: Major/Minor Revision of the syllabus will be allowed as per Mizoram University regulations.

16. Question pattern: The question pattern will contain Very Short (Multiple Choice), Short Answer and Descriptive types. The distribution of marks will be as follows:

a) Theory Papers (Full marks: 75 Marks)
        Part A – Objective (25 marks)

        Section –I (15 marks**)**
        i) Multiple Choice : 10 Questions of 1 mark each (10X1=10 marks).
        (2 questions from each unit)
        ii) True or False: 5 Questions of 1 mark each (5X1=5 marks).
        (1 question from each unit)

        Section-II (10 marks)
        Short Answer – 5 Questions of 2 marks each (5X2=10 marks)
        (1 question from each unit)

        Part B – Descriptive (50 marks)
        5 out of 10 questions to be answered each will carry 10 marks.
        (**2 questions must be set from each Unit, in OR type in which 1 question is to be answered**).

b) Practical Papers (Full Marks: 75)
        Section A: **2 out of 5 Questions to be conducted each of 15 marks (2X15=30 marks).**
        Section B: **1out of 5 Questions to be conducted each of 20 marks (1X20=20 marks).**
        Section C: Viva (15 marks), Practical Record (10 marks).

c) Major Project Work (Full Marks:300, this will be converted into a scale of 100 point)
        External (200 marks)

i)	Project Record	:	25 marks
ii)	Project Development and execution	:	100 marks
iii)	Viva	:	50 marks
iv)	Presentation	:	25 marks

        Internal (100 marks)
        Internal marks distributions will be made by teachers of the concerned colleges for the purpose of the final project work evaluation.

17. Removal of Discrepancy/Difficulties:

Notwithstanding anything contained in this Regulation, any discrepancy/difficulty arising in interpretation of, or giving effect to, any provision of this regulation, shall be referred to the Vice-Chancellor, whose interpretation or decision thereon shall be final.

3 Years Degree BCA Course Structure (Revised 2018)

1st Sem	Name of Paper		Credit	Page No.
BCA/1/CC/01	English Language & Communication Skills	Theory	4	
BCA/1/CC/02	Basic Mathematics	Theory	5	
BCA/1/CC/03	Introduction to Information Technology	Theory	4	
BCA/1/CC/04	Digital Computer Fundamentals	Theory	4	
BCA/1/CC/05	PC Applications & Internet Technology Lab	Practical	3	
BCA/1/CC/06	Office Automation Lab	Practical	3	
			23	
2nd Sem				
BCA/2/CC/07	Personality and Soft Skills Development	Theory	4	
BCA/2/CC/08	Discrete Mathematics	Theory	5	
BCA/2/CC/09	Programming Language through C	Theory	4	
BCA/2/CC/10	Accounting and Financial Management	Theory	4	
BCA/2/CC/11	Programming in C Lab	Practical	3	
BCA/2/CC/12	Tally ERP 9.0 Lab	Practical	3	
			23	
3rd Sem				
BCA/3/CC/13	Operating Systems	Theory	4	
BCA/3/CC/14	Data Structure using C	Theory	4	
BCA/3/CC/15	Database Management Systems	Theory	4	
BCA/3/CC/16	Computer Organization and Architecture	Theory	5	
BCA/3/CC/17	Oracle Lab	Practical	3	
BCA/3/CC/18	Data Structure using C Lab	Practical	3	
			23	
4th Sem				
BCA/4/CC/19	Environment and Ecology	Theory	4	
BCA/4/CC/20	Web Programming	Theory	4	
BCA/4/CC/21	Computer Networking- I	Theory	5	
BCA/4/CC/22	Object Oriented Programming in C++/Java	Theory	4	
BCA/4/CC/23	Web Programming using PHP Lab	Practical	3	
BCA/4/CC/24	C++/Java Programming Lab	Practical	3	
			23	
5th Sem				
BCA/5/CC/25	Software Engineering-I	Theory	5	
BCA/5/CC/26	Computer Graphics	Theory	4	
BCA/5/CC/27	GUI Programming	Theory	4	
BCA/5/EC/28	**Elective-I** (*any one*)		5	
a)	Cloud Computing	Theory		
b)	E-commerce and E-governance	Theory		
c)	IT Act and Cyber Laws	Theory		

BCA/5/CC/29	Minor Project	Practical	3	
BCA/5/CC/30	Programming with VB.NET Lab	Practical	3	
			24	
6th Sem				
BCA/6/EC/31	**Elective-II** (*any one*)		5	
a)	Software Engineering-II	Theory		
b)	Software Project Management	Theory		
c)	Management Information System	Theory		
BCA/6/EC/32	**Elective III** (*any one*)		5	
a)	Data Warehousing	Theory		
b)	Computer Networking -II	Theory		
c)	Mobile Computing	Theory		
BCA/6/CC/33	Major Project	Practical	14	
			24	
	Theory Total(T)		**95**	
	Practical Total(P)		**45**	
		Total(T+P)	**140**	

Marks Distribution of 3 Years Degree BCA (Revised 2018)

Course No.	Name of Paper	Max. Marks Scale		Total	Credit per week			Course Credit	Exam (hrs)	
	1st Semester	Int.	Ext.	Total	L	T	P		T	P
BCA/1/CC/01	English Language & Communication Skills	25	75	100	3	1	0	4	3	-
BCA/1/CC/02	Basic Mathematics	25	75	100	4	1	0	5	3	-
BCA/1/CC/03	Introduction to Information Technology	25	75	100	3	1	0	4	3	-
BCA/1/CC/04	Digital Computer Fundamentals	25	75	100	3	1	0	4	3	-
BCA/1/CC/05	PC Applications & Internet Technology Lab	25	75	100	0	0	3	3	-	3
BCA/1/CC/06	Office Automation Lab	25	75	100	0	0	3	3	-	3
		150	450	**600**	13	4	6	**23**		
	2nd Semester									
BCA/2/CC/07	Personality and Soft Skills Development	25	75	**100**	3	0	1	4	3	1
BCA/2/CC/08	Discrete Mathematics	25	75	**100**	4	1	0	5	3	-
BCA/2/CC/09	Programming Language through C	25	75	**100**	3	1	0	4	3	-
BCA/2/CC/10	Accounting and Financial Management	25	75	**100**	3	1	0	4	3	-
BCA/2/CC/11	Programming in C Lab	25	75	**100**	0	0	3	3	-	3
BCA/2/CC/12	Tally ERP 9.0 Lab	25	75	**100**	0	0	3	3	-	3
		150	450	**600**	**13**	**3**	**7**	**23**		
	3rd Semester									
BCA/3/CC/13	Operating Systems	25	75	**100**	3	1	0	4	3	-
BCA/3/CC/14	Data Structure using C	25	75	**100**	3	1	0	4	3	-
BCA/3/CC/15	Database Management Systems	25	75	**100**	3	1	0	4	3	-
BCA/3/CC/16	Computer Organization and Architecture	25	75	**100**	4	1	0	5	3	-
BCA/3/CC/17	Oracle Lab	25	75	**100**	0	0	3	3	-	3
BCA/3/CC/18	Data Structure using C Lab	25	75	**100**	0	0	3	3	-	3
		150	450	**600**	13	4	6	**23**		
	4th Semester									
BCA/4/CC/19	Environment and Ecology	25	75	**100**	3	1	0	4	3	-
BCA/4/CC/20	Web Programming	25	75	**100**	3	1	0	4	3	-
BCA/4/CC/21	Computer Networking- I	25	75	**100**	4	1	0	5	3	-
BCA/4/CC/22	Object Oriented Programming in C++/Java	25	75	**100**	3	1	0	4	3	-
BCA/4/CC/23	Web Programming using PHP Lab	25	75	**100**	0	0	3	3	-	3
BCA/4/CC/24	C++/Java Programming Lab	25	75	**100**	0	0	3	3	-	3
		150	450	**600**	13	4	6	**23**		
	5th Semester									
BCA/5/CC/25	Software Engineering-I	25	75	**100**	4	1	0	5	3	-
BCA/5/CC/26	Computer Graphics	25	75	**100**	3	1	0	4	3	-
BCA/5/CC/27	GUI Programming	25	75	**100**	3	1	0	4	3	-

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BCA/5/EC/28	**Elective-I** (*any one*)	25	75	**100**	4	1	0	5		3	-
a)	Cloud Computing										
b)	E-commerce and E-governance										
c)	IT Act and Cyber Laws										
BCA/5/CC/29	Minor Project	25	75	**100**	0	0	3	3			
BCA/5/CC/30	Programming with VB.NET Lab	25	75	**100**	0	0	3	3			
		150	450	**600**	14	4	6	**24**			
	6th Semester										
BCA/6/EC/31	**Elective-II** (*any one*)	25	75	**100**	4	1	0	**5**		3	-
a)	Software Engineering-II										
b)	Software Project Management										
c)	Management Information System										
BCA/6/EC/32	**Elective III** (*any one*)	25	75	**100**	4	1	0	**5**		3	-
a)	Data Warehousing										
b)	Computer Networking -II										
c)	Mobile Computing										
BCA/6/CC/33	Major Project	100	200	**300**	0	0	14	**14**		-	6
		150	350	**500**	8	2	14	24			
	Grand Total (T+P)	900	2600	**3500**				**140**			
	Total Theory(T)							**95**	**68%**		
	Total Practical(P)							**45**	**32%**		

L = Lecture, T = Tutorial, P = Practical, CC = Core Course, EC = Elective Course

First Semester
Name of Paper: English Language & Communication Skills
Course No.: BCA/1/CC/01

Marks Scale: **100** marks (End Sem. Exam: 75+Int.: 25)   Credit: **4**
          (3- 0- 1)

Unit 1 : Grammar 1   (10L)
Parts of Speech, Definition & Identification of Subject and Predicate, Phrases & Clauses, Tense – Types of Tenses & their use.

Unit 2: Grammar 2   (10L)
Voice – Active voice and Passive voice, Concept of Concord – What is Concord? Subject - Verb Agreement; Reported Speech – Direct and Indirect Speech.

Unit 3 : Introduction to Language Communication   (10L)
Importance of English Language, Basics of Communication – Process of Communication, Components of Communication, factors of Communication; Barriers to Communication – Physical, Psychological, Semantics, Organizational and Interpersonal Barriers; How to overcome Barriers.

Unit 4: Communication Skills in English   (10L)
Language Skills- Reading Skills and Listening Skills; Verbal Communication- Vocal Communication techniques and Oral Presentation; Non Verbal Communication- Personal appearance; Facial Expression, Movement, Posture, Gesture, Eye Contact.

Unit 5: Oral Communication   (P = 1Credit)
(Practical to be conducted in the College)
Facing Interview-Viva Voce, Different forms of classroom interaction-seminar, paper presentation, Group Discussion, Public Speaking.

Recommended Books:

1) R.C.Sharma& Krishna Mohan: *Business Correspondence & Report Writing, A Practical Approach to Business and Technical Communication*, Tata McGraw Hill. **(New)**
2) Aruna Koneru: *Professional Communication*, Tata McGraw Hill Pub. Co. Ltd.
3) Wren & Martin: *English Grammar and Composition,* S. Chand Publisher (2011)

First Semester
Name of Paper: Basic Mathematics
Course No.: BCA/1/CC/02

Marks Scale: 100 marks (End Sem. Exam: 75+Int.: 25)   Credit: **5**
                                                                          (4- 1- 0)

Unit-1 (10L)
Number system: Natural number, whole number, integer, real, even, odd, prime, composite, rational, irrational, decimal numbers; Test for divisibility of number; LCM and HCF of numbers; Square and cube roots; Surds and indices; Fractions: Insertion of any number between two given fraction; Simplification(VBODMAS); Algebraic formula

Unit-2(10L)
Algebraic expression: monomial, binomial, trinomial, polynomial, degree of polynomial, multiplication and division of polynomial; Factorisation; Linear equations in one and two variables; Quadratic equation; Problems on numbers; Ratio and proportion; Average; Percentage

Unit-3(10L)
Profit and loss; simple interest; compound interest; Discount; Partnership; Alligation(or mixture); Stock and shares; Time, Work and Distance; Pipes and Cistern; Boats and stream; Problems on train; Calendar and clocks; Data interpretations

Unit-4(10L)
Sequence and series: Definition of sequence, series and progression; Arithmetic progression(AP): n^{th} term of an AP, Sum of n terms of an AP, Arithmetic mean(AM), Properties of an AP; Geometric progression(GP): nth term of GP, Sum of n terms of GP, Geometric mean(GM), Properties of GP; Harmonic progression(HP); Harmonic mean(HM); Relation between AM, GM and HM

Unit-5(10L)
Matrices: Definition of a matrix; Types of matrices, Addition and multiplication of matrices; Transpose of matrix: symmetric and skew symmetric matrices; Row and column operations; inverse of a matrix by using elementary row operations; Adjoint and inverse of a matrix; System of linear equations by matrix method; Determinants: minors and cofactors; expansion of determinants; properties of determinants.

Recommended Books :
1. R.S. Aggarwal: Senior Secondary School Mathematics for Class 11,Bharti Bhavan (Publishers and Distributors)
2. R.S. Aggarwal: Senior Secondary School Mathematics for Class 12, Bharti Bhavan (Publishers and Distributors)
3. SSC CGL Pre Examination, Compiled and edited by Arihant Expert Team, Arihant Publication (India) Limited
4. Quantitative Aptitude by Dr R.S. Aggarwal, S. Chand Publication

First Semester
Name of Paper: Introduction to Information Technology
Course No.: BCA/1/CC/03

Marks Scale: **100** marks (End Sem. Exam: 75+Int.: 25)   Credit: **4**
                                                                 (3- 1- 0)

Unit –1 (10 L)
Data and Information: Introduction, Types of Data, A Simple Model of a Computer, Data Processing Using a Computer, Desktop Computer, Data storage, storage cell, physical device used as memory cells, random access memory, read only memory, secondary storage, compact disk read only memory(CDROM), archival store
Central Processing Memory: Introduction, The Structure of a Central Processing Unit, Specification of a CPU, Interconnection of CPU with Memory and I/O Units, Embedded Processors
Unit –2 (10 L)
Output devices: Introduction, Video Display Devices, Flat Panel Displays, Printers, Audio Output
Computer Software: Introduction, Operating System- Definition, functions of operating system, concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user & multi-user operating system, Programming Languages, A Classification of Programming Languages, assemblers, compilers, interpreters, linkers, algorithms, flow charting, decision tables, pseudo code.
Unit –3 (10 L)
Software concepts: Definition, types of software: system & application software packages, hardware &software.
Data Organisation: Introduction, Organizing a Database, Structure of a Database, Database Management System, Example of Database Design, Non-text Databases, Archiving Databases
Unit – 4 (10 L)
Computer Networks: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN,WAN and MAN), OSI & TCP/IP Model, Network, Client and Servers, Host & Terminals, TCP/IP.
Unit – 5 (10 L)
Some Internet Applications: Introduction, E-mail, Information Browsing Service, The World Wide Web, Information Retrieval from the World Wide Web, Other Facilities Provided by Browsers, Audio on the Internet, Pictures, Animation and Video via Internet
Societal Impacts of Information Technology: Introduction, Privacy, Security and Integrity of Information, Disaster Recovery, Intellectual Property Rights, Careers in Information Technology

Recommended Books:
1. V. Rajaraman: *Introduction of Information Technology*,2nd Edition,PHI Learning Private Limited(2013)
2. P. K. Sinha & PritiSinha : *Computer Fundamentals*, BPB Publications (2009).
3. Peter Norton : *Introduction to Computers*, 4th Edition, TMH (2001).
4. Alex Leon & Mathews Leon : *Introduction to Computers*, Vikas Publishing House (2001)

First Semester
Name of Paper: Digital Computer Fundamentals
Course No.: BCA/1/CC/04

Marks Scale: **100** marks (End Sem. Exam: 75+Int.: 25)   Credit: **4**
                                                                              (3- 1- 0)

Unit 1:   **(10L)**
Introduction to Number system and Codes – Digital computers and Digital Systems, Binary Numbers, Octal and Hexadecimal numbers, Number Base Conversion- different number systems and their conversions (Decimal, Binary, Octal, Hexadecimal), Complements- r's complement and (r-1)'s complement, Binary Codes- Decimal Codes, Error Detection Codes, Alphanumeric Codes.

Unit 2:   **(10L)**
Boolean algebra: Basic Definition, Basic theorems and properties of Boolean algebra, De-Morgan's theorems, Simplification of Boolean algebra, Boolean functions, Canonical and Standard forms, sum of minterm, product of maxterm, Karnaugh map- two, three and four variable maps, Sum of Product and Product of Sum simplification.

Unit 3:   **(10L)**
Digital Arithmetic: addition using 9's and 10's, addition using 1's and 2's compliment, multiplication and division of binary number.
Logic gates: Digital logic gates- AND, OR, NOT, XOR, XNOR, NAND, NOR. Universal property of NAND gate and NOR gate, implementation of Boolean function using logic gates.

Unit 4:   **(10L)**
Combinational Logic – Introduction, Design procedure, circuit diagram, truth table of Adders (half and full), Subtractor (half and full), Decoder (2:4, 3:8), Encoder (4:2, 8:3), Multiplexer (4:1, 8:1), De-multiplexer (1:4, 1:8), Programmable Logic Array (PLA).

Unit 5:   **(10L)**
Sequential Logic- Flip-Flops - RS flip-flops, D flip-flops, JK flip-flops. T flip-flops, Master slave flip-flop, edge trigger flipflop.
Registers- Register, Shift Register.
Asynchronous counters -Four bit ripple counter, BCD counter.
Synchronous counter- Binary Counter, BCD Counter.

Recommended Books:
1. M.Morris Mano: Digital Logic and Computer Design, Eastern Economy Edition, Prentice Hall of India, 2003.
2. Malvino, Brown: Digital Computer Electronics, 3rd Edition,1995, Tata McGraw Hill.
3. Malvino, Paul Albert and Leach, Donald P: Digital Principles and Applications, 4th Edition, 2000. TMH.
4. Malvino, Paul Albert and Leach, Donald P: Digital Computer Fundamentals, 3rd Edition, 1995. TMH.

First Semester
Name of Paper: PC Applications & Internet Technology Lab
Course No.: BCA/1/CC/05

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)   Credit: **3**
                                                                                        (0- 0- 3)

A. Record Book (10 marks)
B. Viva Voce (15 marks)
C. Practical (50 marks)
Windows Basic and DOS:
Personalizing Windows - Backgrounds, Themes, Working with Files and Folders, Windows Accessories - Paint, Notepad, Wordpad, etc. Windows Tools - Disk Cleanup, Defragmenter, System Restore, etc.
Important DOS commands, Internal Commands - CD, Cls, Color, Copy, Date, Del, Dir, Echo, Exit, Goto, Md, Move, Pause, Prompt, Rd, Ren, Time, Ver, Vol; External Commands - Append, At, Attrib, Chkdsk, Edit, Help, Ipconfig, Label, More, Netstat, Shutdown and creating Batch Files.
HTML
HTML 5 Documents Basics, DOCTYPE, Head, Body, and Body, CSS Styles, Headings and Heading Styles, Page Divisions: div for Structure and Layout, Paragraph and Text Styles, Links and Link Styles, Multimedia, Images, and Image Styles, Lists and List Styles, Tables and Table Styles, Forms and Form Styles.
Practical Demonstration of the followings
1) Display your family information with background and other formatting
2) Design a webpage to display your college with hyperlink.
3) Write an HTML documents to print the following:
      a. Animal
            i. Lion
            ii. Tiger
            iii. Elephant
      b. Colours
            i. Red
            ii. Yellow
            iii. Green

4) Write HTML document to illustrate the uses of the following tags with all attributes.
   <H1>THROUGH<H6>,<P>,<B>,<I>,<BLOCKQUOTE>,<PRE>,<OL>,
   <UL>,<DL>,<DT>,<DD>,<HR>,<U>,<SUB>,<SUP>,<STRIKE>,<CENTER>,
   <FONT>,<MARQUEE>,<IMG>,<A>

5) Develop and demonstrate a XHTML document that illustrates the use external style sheet, ordered list,table, borders, padding, color, and the <span> tag.
6) Write HTML document to create top and dropdown navigation bar
7) Write a set of frames to show the following data

Fruits Animal Birds	Select any of the item shown on the left

8) Write HTML document to create a given table structure using all the table related tags to include the following features:

One column	One row and three columns	Two rows and three columns
100	100 200 300	100 200 300 400 500 600

- Different colors and background Images
- Spanning of rows and columns
- Cell spacing and padding.

9) Write HTML document to create a given table structure using all the table related tags to include the following features:

Display the picture MIT	STUDENTS FEE RECORD			
	Roll No.	First Name	Last Name	Fees paid
Row 1	1			
Row 2	2			
Row 3	3			

10) Develop an HTML document for a web page of your favourite City.Design page with an attractive background color,text color and background image.

Recommended Books:
1. Lemay Colburn Kyrnin: *Mastering HTML, CSS & Javascript Web Publishing* , BPB Publications(2016)
2. Thomas. A. Powell : *The Complete HTML and CSS References*, 5th Edition, McGraw Hill (2010).
3. Jon Duckett: *HTML & CSS: Design and Build Web Sites*, John Wiley & Sons (2011)
4. Jon Duckett: *Javascript and Jquery: Interactive Front-end Web Development*, CreateSpace Independent Publishing Platform(2017)

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

First Semester
Name of Paper: Office Automation Lab
Course No.: BCA/1/CC/06

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)   Credit: **3**
                                                                    (0- 0- 3)
A. Record Book   **(10 marks)**
B. Viva Voce   **(15 marks)**
C. Practical   **(50 marks)**

Unit 1 - Microsoft Word 2010
Word Introduction, The Workplace, Typing and Editing, Bullets and Numbering, Finding and Replacing,
AutoCorrect, Formatting Text and Paragraphs, Header and Footers, Sorting Lists, Working with Tables and
Using Formulae in Tables, Graphics and Multimedia, Page Design and Layout, File Management, Opening,
Saving, and Protecting Documents, Printing, Mail Merge
Practical may be given for
1. Creating the documents with Special effects like font, color, underline, bold, different size,
2. Find and Replace operations like cut, paste, copy clipboard.
3. Bullets, Numbering and sorting
4. Paragraphs, alignment, indentation, line spacing
5. Inserting Pictures
6. Printing the documents, it includes paper-size, margins, header and footer, page no.
7. Creating a table, drawing table.
8. Using reference tools like table of contents, footnote, endnote
9. Using review tools- spell check, comments, document protection
10. Mail merge

Unit 2 - Microsoft Excel 2010
Introduction to Excel, Working in Workbooks and Worksheet, Entering Data, Using Formulas and
Functions to Calculate Values, Editing a Worksheet, formatting a Worksheet, Creating Charts, (graphs),
Chart Types, Formatting Chart, Data sorting and filtering Data in a List, Adding Comments to Documents,
Recording and Using Macros, Saving and Protecting a Workbook.
Practical may be given for
1. Creating Worksheets.
2. Formatting cells, Worksheets etc.
3. Printing, Inserting, Deleting, Copying, Moving worksheets.
4. Formulas, Built-in functions.
5. Graph-Plotting facilities.
6. Protection facility

7. Macro facility

Unit 3 - PowerPoint 2010

PowerPoint Basics, Creating New Slide, Inserting and Deleting slides, Slides Layout, Inserting sound,
picture and multimedia objects, creating different charts, Setting and Editing Slide Designs, Setting
Transition Effects, Choosing Animations, Setting Custom Animations, Rehearsing and Viewing Slide
Shows.

Unit 4 - Access 2010

Access Basics, Creating Tables, Setting Primary Keys, Table Relationships, Creating Views, Using
Operators in Queries, Creating Access Forms, Creating Reports.

Recommended Books:

1. The AGI Training Team: *Microsoft Office 2010 Digital Classroom*, Wiley Publishing Inc (2011).

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

Second Semester
Name of Paper: Personality and Soft Skills Development
Course No.: BCA/2/CC/07

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)   Credit: **4**
(3- 1- 0)

Unit 1: Introduction to Personality Development   **(10L)**
Basics of Personality Development and its importance- Definition, Components and Scope, Communication Skills and Personality Development.

Unit 2 : Grooming Personality   **(10L)**
Motivation, Leadership skills and team building, Goal setting, Time Management and Effective planning.

Unit 3: Elements of a Letter   **(10L)**
Email Communication- introduction, techniques for writing effective e-mail, email etiquette, Letter Writing- Job Application letters, writing Resume.

Unit 4: Business Letter   **(10L)**
Business Letters- Letter of Enquiry, quotations, order and acknowledgement letters, complaint and adjustment letters.

Unit 5: Effective Writing   **(10L)**
Writing Abstracts and Summaries; Report Writing- Structure and Layout, Elements of Structure, Front Matter, Main Body, Back Matter; Laboratory Reports.

Recommended Books:

1.   Rajiv K Mishra: *Personality Development*, Rupa& Co.
2.   Wallace and Masters: *Personal Development for Life Work*, 8th Edition, Thomson
3.   Goodwill Publishing House: *All About Body Language*
4.   R.C Sharma-Krishna Mohan: *Business Correspondence and Report Writing,* Tata McGraw Hill Pub. Co. Ltd.
5.   Aruna Koneru: *Professional Communication*, Tata McGraw Hill Pub. Co. Ltd.

Second Semester
Name of Paper: Discrete Mathematics
Course No.: BCA/2/CC/08

Marks Scale: **100** marks (End Sem. Exam: 75+Int.: 25)   Credit: **5**
                                                           (4- 1- 0)

Unit 1 (10L)
Set Theory: Sets; Different type of sets and problems, Roster form(or Tabulation Method), Venn Diagrams; Boolean Algebra, General Properties of Boolean Algebra, Boolean functions, Boolean Switching.

Unit 2(10L)
Logic and Proposition Calculus: Statements and Notation, Connectives, Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Conditional and Biconditional Statements; Tautologies and Contradictions; Logical Equivalence; Logical Implication, Predicates.

Unit 3(10L)
Permutations and Combinations: Factorial Notation, Fundamental Principles of counting, Permutations (including practical problems); Combinations (including practical problems)
Binomial Theorem: Binomial Theorem for Positive Index; Observations in a Binomial Expansion; the beginning, coefficient, independent term.

Unit 4(10L)
Number Theory: Divisibility, Division algorithm, Greatest Common Divisor, Existence and uniqueness of GCD, Relatively Prime Integers, LCM, Euclid's Lemma, Unique factorization, Congruence of Integers, Euler's phi-function, Fermat's theorem, Euler's theorem.

Unit 5(10L)
Graph Theory: Graph, Simple graph, multigraph, Directed graph, Weighted graph; Bipartite graphs; Eulerian and Hamiltonian graphs; Subgraphs.
Tree: Spanning Tree; minimum spanning tree; planar and non-planar graphs; Graph colouring; Adjacency Matrix and Incidence Matrix, Shortest Path Algorithm – Prims and Kruskals.

Recommended Books:
1. MK Gupta: *Discrete Mathematics*, Krishna Prakashan Media(P) Ltd. Meerut
2. J.P. Tremblay and R. Manohar: *Discrete Mathematical Structures with Applications to Computer Science*; Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
3. Narsingh Deo: *Graph Theory with Applications to Engineering and Computer Science*, Prentice Hall of India Private Limited.
4. A.R. Vasishtha and A.K. Vasishtha: *Modern Algebra*, Krishna Prakashan Media(P) Ltd. Meerut

Second Semester
Name of Paper: Programming Language through C
Course No.: BCA/2/CC/09

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
          (3- 1- 0)

Unit 1 (10L)
Overview of C:Importance of C, sample C programs, basic structure of C programs, Programming style, executing C program. Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, assigning value to variable, defining symbolic constants.
Operators and Expression: Operators - arithmetic, relational, logical, assignment, increment-decrement, conditional, bit-wise and special. Arithmetic expressions, evaluation of expressions, precedence of arithmetic operators, type conversions in expressions, operator precedence and associativity.
Managing Input and Output Operators: Formatted input/output-more about printf() and scanf() functions. Unformatted input – getchar(), getch(), getche(), gets(). Unformatted output – putchar (), puts ().

Unit 2 (10 L)
Overview of C: Decision making with IF statement: simple IF statement, the IF-ELSE statement, nesting of IF…ELSE statements, the ELSE IF ladder. The switch statement, break, continue, goto statements, enum; Decision Making and Looping :Looping statements - WHILE, DO….WHILE and FOR. Nesting and Jumps in loops, Infinite loop

Unit 3 (10 L)
Functions: Definition, prototype of a function, standard library functions, User -Defined Functions, Need for user-defined functions, return values and their types, category of functions: no arguments and no return values, arguments but no return values, arguments with return values. Handling of non-integer functions, calling a function-call by value and call by reference, recursion and iteration, storage classes of variables automatic, static, register and external, their scopes and lifetime.

Unit 4: (10 L)
Arrays: Definition, declaration and initialization: One-dimensional arrays, two-dimensional arrays. Multidimensional arrays.
Pointers: Definition, accessing the address of variable, declaring and initializing pointers, accessing a variable through its pointer, pointers and arrays, arrays of pointers, pointers and functions.

Unit 5 : (10 L)
Structures and Unions**:** Structure definition, structure initialization, user-defined data types, arrays of structures, arrays within structures, structures within structures, structures and functions, pointers and structures. Self-referential structures, union, tydef.
File Management in C**:** File concept, various operations on files – Defining, opening, closing, input/output operations on files, command line arguments.

Recommended Books:
1. E. Balagurusamy : *Programming in ANSI C*, Tata McGraw Hill Publications (2004).
2. Ashok. N.Kamthane : *Programming with ANSI and Turbo C*, Pearson Education (2006).
3. B. Kernigan and D. Ritchie : *The ANSI C Programming Language*, PHI Publications (1988).
4. Byron Gottfried : *Programming with C*, Tata McGraw Hill Publications (2010).

Second Semester
Name of Paper: Accounting and Financial Management
Course No.: BCA/2/CC/10

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                                   (3- 1- 0)

Accounting:

Unit – 1 :   **(10L)**
Introduction to Accountancy: definition, objectives, advantages & limitations; Accounting Principles, Concepts & Conventions, Double entry System; Rules of Debit & Credit – Modern (American) Approach & Traditional rules (British Approach), Journal; Accounting equation. Ledger Accounts: Meaning, classifications, ledger posting from journal entries, ledger posting from Cash book,
Accounting for Cash - Cash book (three column Cash book).

Unit-2:   **(10L)**
Trial Balance: Meaning, special features and objectives; Preparation of trial balance.
Financial statement(with adjustment): Meaning of Trading, Profit & Loss a/c and Balance Sheet, *Adjustments:* Closing stock, outstanding expenses, prepaid expenses, Accrued income, advance income, bad debts, provision for bad and doubtful debt, provision for discount on debtors and creditors, Depreciation, interest on capital, interest on drawing, interest on loans.

Unit-3:   **(10 L)**
Ratio Analysis: Meaning of Accounting ratios, objectives and limitations. Types of ratios and their usefulness – Liquidity Ratio, Profitability Ratio, Efficiency ratio, solvency ratios.

Financial Management:

Unit-4:   **(10 L)**
Introduction to Management Accounting: Meaning, objectives, nature & scope, advantages & limitations of Management accounting. Differences between Financial Accounting and Management Accounting, Management Accounting and Cost Accounting. Management Accountant's position, roles and responsibilities.
Standard costing- Meaning, objective, advantages & limitations of Standard Costing.

Unit- 5:   **(10 L)**
Budgeting: Definition, Budget Vs Forecasts, and Essentials of budgeting. Types of Budget – Functional, Master, Fixed, flexible Budget and zero-based budget.(Theory and simple problems), Budgetary Control: Meaning, objectives, advantages and limitations.
Unit Costing: Preparation of Cost Sheet and Tender Price Statement.

Recommended Books:
1. N. Maheshwari: *Cost andManagement Accounting,* Sultan Chand & Sons (2013).
2. M. N. Arora : *Cost & Management Accounting,* Vikas Publishing House Pvt Limited (2009).
3. Basu & Das *: Practice in Accountancy*, Vol-I, Rabindra Library (2004).
4. N. Maheswari : *Advance Accounting*, Vikas Publication House Pvt. Ltd (2009).
5. R. L. Gupta : *Advance Accounting*, Sultan Chand (1999).

Second Semester
Name of Paper: Programming in C Lab
Course No.: BCA/2/CC/11

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)　　　　　　Credit: **3**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(0- 0- 3)

  A. **Record Book**　　　　　　　　　　　　　　　　　　　　　　**(10 marks)**
  B. **Viva Voce**　　　　　　　　　　　　　　　　　　　　　　　**(15 marks)**
  C. **Practical**　　　　　　　　　　　　　　　　　　　　　　　　**(50 marks)**

List of Minimum Practical to be performed:

Unit 1 – C Programming Basics
1) Marks obtained by a student in five different subjects are input through the keyboard. Calculate the percentage and display on the screen. Assume that the maximum marks in each subject is 100.
2) Temperature of your city in Fahrenheit degrees is input through the keyboard. Write a program to convert this temperature into Centigrade degrees.

Unit 2 – Operators, Expressions, Branching and Looping
3) Write a C program for demonstration of nested if...else statement to find out the greatest of three numbers input by the user.
4) Percentage of your attendance is input through the keyboard. Write C program to calculate and display internal mark based on percentage of attendance as given below:
      if attendance >= 95, internal mark is 5
      if attendance >= 90 && <95, internal mark is 4
      if attendance >= 85 && <90, internal mark is 3
      if attendance >= 80 && <85, internal mark is 2
      if attendance >= 75&& <80, internal mark is 1
      if attendance <75%, internal mark 0 and not eligible to appear in examination.
5) Write a C program which input three numbers and display the largest number using conditional operator.
6) Write a C program using switch to display day of the week by entering the corresponding number. For example, if input is 1, it will display Sunday and so on.
7) Write a C program to print the Fibonacci series up to n terms using while loop.
8) Write a C program to check whether the given number is prime or not.

Unit 3 – Arrays and String Handling Functions
9) Write a program to perform Linear Search of any value in an array and display the position of the value if found.
10) Write a program using C to perform binary search for any item in an ordered array and display the position of the item if found.
11) Elements of two matrices are input by the user. Write a C program to find and display the addition and subtraction of the two matrices.
12) Using C programming language, write a program to find the transpose of a matrix.

13) Write C program to find the multiplication of two matrices using two dimensional array.
14) Write a program in C to accept lines of text and then display the number of alphabets, digits and special characters.

Unit 4 – Functions and Structures
15) Write a recursive function program using C to find the factorial value of any number entered through the keyboard.
16) Write a C program to demonstrations functions call by value and call by references.
17) Write a C program to reverse the accepted number using function.
18) Write a C program to convert decimal number to its equivalent binary number using function.
19) Define a structure called student with data members RollNo, Name and Percentage. Also write two functions getdata() to input data and printdata() to display the data.

Unit 5: Pointers and File Management in C
20) Write a C program to read and print student details such as roll number as integer, name as character and percentage as float using structure pointer.
21) Write a C program to create file "Student.txt" which will save student information such as student roll number, name and total marks for n students and display lists of students on screen by reading from the same file.
22) Write a program in C to accept lines of text to save into a file and then read from the same file to display the number of alphabets, digits and special characters on the screen.

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

Second Semester
Name of Paper: Tally ERP 9.0 Lab
Course No.: BCA/2/CC/12

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **3**
                                                               (0- 0- 3)

A.	**Record Book**	**(10 marks)**
B.	**Viva Voce**	**(15 marks)**
C.	**Practical**	**(50 marks)**

PART A:
1. Meaning of Tally, importance, benefits of tally.
2. Creating
 a. New company
 b. Security Controls
 c. Groups
 d. Ledger
 e. Voucher Type
3. Modifying
 a. New company
 b. Security Controls
 c. Groups
 d. Ledger
 e. Voucher Type
4. Voucher Entry
5. Generating Profit & Loss Account, Trial Balance and Balance Sheet
6. Backup & Restore.

PART B:
1.GST in tally ERP.9.0
2.Application of GST in company
3.How to import GST.
 a)Ledger creation
 b)Multi GST sales transaction
 c)Tax invoice
 d)Receipt entry for advance payment.

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

Third Semester
Name of Paper: Operating Systems
Course No.: BCA/3/CC/13

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                                             (3- 1- 0)

Unit 1: Introduction To Operating System
Definition of Operating Systems, Functions of Operating Systems, Services of Operating Systems, Types of Operating Systems: Batch, Multiprogrammed, Time sharing, Personal-computer systems, Parallel systems, Real time and Distributed Operating Systems .

Unit 2: Process Management:
Definition of a Process – Process states – Process Control Block – Scheduling Criteria – Schedulers: Short term, Medium term and Long term schedulers – Scheduling Algorithms: FCFS, Round Robin, SJF and Priority Algorithms (preemptive and non preemptive) . Critical Section Problem : Dining Philosophers, Producer Consumer, Readers Writers– Semaphores – Monitors
Threads Overview, Multicore Programming, Multithreading models- many-to-one model, one-to-one model, many-to-many model.

Unit 3: Deadlock:
Definition of a Deadlock, Deadlock Characterization: Necessary Conditions, Resource-Allocation Graph, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance-Safe State, Resource-allocation-Graph Algorithm-Banker's Algorithm. Deadlock Detection, Recovery from Deadlock.

Unit 4: Memory Management
Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation. Virtual Memory: Demand Paging, Page Replacement : FIFO and LRU

Unit 5: File System:
File Concept, File Attributes, File Operation, File Types. Access Methods-Sequential Access and Direct Access. Directory Structure-Single-Level Directory, Two-Level Directory, Tree-Structured Directories, Acyclic-Graph Directories.
File protection- Access Control List (ACL), other protection approaches, Allocation methods: Contiguous, linked and index allocation.

Reference Books:
1. Silberschatz, Abraham and Galvin, Peter Baer: *Operating System Concepts*. 9th Edition. John Wiley and Sons
2. Milan Milenkovic: *Operating Systems Concepts and Design*, McGraw Hill 1987
3. Tanenbaum, S Andrew: *Operating Systems – Design and Implementation*, PHI, 2001.
4. Stalling Williams: *Operating Systems*, PHI, 2001

Third Semester
Name of Paper: Data Structure using C
Course No.: BCA/3/CC/14

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                                                                                        (3- 1- 0)

Unit 1: Introduction to Data Structures
Definition-Classification of data structures (Linear and Non-Linear), Operations on data structures. Complexity - Time-Space complexity.
Review of Arrays, Structures and Unions. Pointers and Dynamic Memory Allocation Functions- Malloc, Calloc, free and rallocation function.

Unit 2: Stack & Queues
Stacks- Concepts, Operations, Application of stacks- conversion from infix to postfix and prefix expression, evaluation of postfix expression using stacks (no algorithms), Recursion – Factorial, GCD, Fibonacci Sequence, Tower of Hanoi
 Queues- Concepts, operations, Linear Queue (FIFO), Circular queues, and Deque (Introductory concepts)-Application of queues.

Unit 3: Searching and Sorting
Searching : Sequential and Binary Search.
Sorting- Bubble sort, Selection sort, Insertion sort, Merge sort , Quick sort.

Unit 4: Linked Lists
Linked list- Representation of linked lists in memory-Operations on linked list (Insertion, Deletion, Display)-Circularly linked linear lists (Insertion, Deletion, Display)-Doubly linked linear list (Insertion, Deletion, Display)-Applications of linked linear lists.

Unit 5: Graphs and Trees
Trees**-**Binary trees, Complete Binary tree, Binary Search Trees – Searching and Inserting in Binary Search Trees, Deletion in a binary search tree. Traversals on a Binary Tree (In-order, post-order, pre-order), -Application of Trees.
Graphs: Traversal methods: Breadth First Search and Depth First Search.

Recommended Books:
- A.M.Padma Reddy : *Systematic Approach to Data Structures using C*, United Publishers (2012)
- Seymour Lipschutz: *Data Structures*, Schaum's Outlines, Revised 1st Edition, McGraw Hill, 2014
- Gilberg & Forouzan: *Data Structures: A Pseudo-code approach with C,* 2nd Edition, Cengage Learning, 2014.

Third Semester
Name of Paper: Database Management Systems
Course No.: BCA/3/CC/15

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25) Credit: **4**
(3- 1- 0)

Unit 1. Introduction, Database Architecture and Modeling (10 L)
Introduction to Database: Importance of database, Characteristics of database approach, difference between database approach and File oriented approach, Characteristics of data in database, meaning of database system, Database users; Database management systems (DBMS): Meaning, advantages of using a DBMS; Types of DBMS : Hierarchical, network, relational, object-oriented, object-relational; Database system concepts and architecture : Data Models, schemas, and instances, Three schema architecture, Data Independence; Design Constraints.

Unit 2. Entity Relationship Model and Relational DBMS: (10 L)
Conceptual database model : ER Model, Defining relations; Components of ER model : Entities and attributes, Entity types, entity sets, keys and value set, symbols of ER-Diagram; Relationship: one-to-one, one-to-many, many-to-many, examples of ER-Diagram; Enhanced Entity-Relationship (EER): Super classes, subclasses and inheritance, Specialization and Generalization and their constraints. Introduction to RDBMS Terminologies : characteristics of relation, Domain constraints , Entity, attributes and tuples, relational data integrity.

Unit 3. Data normalization, Relational Algebra & Relational Calculus : (10 L)
Type of Key attributes; Functional dependencies**;** Introduction to Normalization : General definitions and its importance; Normal forms : First, second, third, fourth, fifth form, Boyce-Codd Normal form. Relational algebra : Relational algebraic operations - (union, intersection, difference, project, Cartesian product, rename, select, division, join.), Examples of queries in Relational Algebra; Relational Calculus: Tuple relational calculus, Domain relational calculus.

Unit 4. Introduction to SQL. (10 L)
Characteristics and advantage of SQL, data types: data types, literals, string, numeric; specifying constraints in SQL. Types of SQL commands : DDL, DML, DCL; SQL operations - arithmetic, comparison, logical and set operators, Operator precedence, Examples of basic Queries and sub queries Aggregate functions : Applications, general rules, examples of Aggregate functions provided by SQL. Table: create, modify, alter, drop. Views: and indexes. Insert, update and Delete operations. Joints, unions, Intersections, Minus. Cursors in SQL, Embedded SQL.

Unit 5. Back, Recovery, Database Security and Integrity (10 L)
Database Security: Requirement of Database security, Dimension, risks and security requirements, Giving Privileges to protecting the data, Authorization and Views, data encryption. Database backups : Causes of failures, Importance of backup, Back-up mechanism logging, checkpointing. Recovery techniques : Deferred update, intermediate update, shadow paging; Detached transaction actions; Recovery in multi-database systems.
Integrity constraints : basic concepts, Types, Restriction on integrity constrains, Data security risk. Granting and revoking privileges and roles.

Recommended Books:
1. A. Leon & M. Leon: *Database Management Systems*, Vikas Publication House Pvt.Ltd (2008).
2. R. Elmasri, S Navathe: *Fundamentals of Database System*, Pearson / Addison Wesley; 5th edition (2006).

Third Semester
Name of Paper: Computer Organization and Architecture
Course No.: BCA/3/CC/16

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25) Credit: **5**
(4- 1- 0)

Unit 1 (10 L)
Register Transfer and Micro Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfer – three state bus buffer, memory transfer, binary adder, binary adder subtractor, binary incrementer, arithmetic circuit, Logic Micro Operations, Shift Micro Operation, Arithmetic Logic Shift Unit.

Unit 2: (10 L)
Basic Computer Organization and Design: Instruction Codes – Stored Program Organization, Indirect Address; Computer Registers; Computer Instructions – Instruction Set Completeness, Timing and Control; Instruction Cycle – Fetch and Decode; Input- Output and Interrupt – Input-Output configuration, Input-Output Instructions; Design of Basic Computer.

Unit 3: (10 L)
Central Processing Unit: Introduction, General Register Organization – Control Word, Examples of Microoperations; Stack Organization – Register Stack, Memory Stack; Instruction Formats – Three-Address Instructions, Two-Address Instructions, One-Address Instructions, Zero-Address Instructions, RISC Instructions; Addressing Modes – Different types of Addressing Modes; Data Transfer and Manipulation – Data Transfer Instructions, Data Manipulation Instructions, Arithmetic Instructions, Logical and Bit Manipulation Instructions, Shift Instructions; Program Control; Reduced Instruction Set Computer- CISC Characteristics, RISC Characteristics. g

Unit 4: (10 L)
Input-Output Organization: Peripheral devices; Input-Output Interface - I/O Bus and Interface Modules, I/O versus Memory bus, Isolated versus Memory-Mapped I/O, Example of I/O interface; Asynchronous data transfer – Strobe control, Handshaking; Modes of transfer – Programmed I/O, Interrupt-Initiated I/O; Priority Interrupt; Direct Memory Access - DMA Controller, DMA Transfer; Input-Output Processor – CPU-IOP Communication.

Unit 5: (10 L)
Memory Organization: Memory Hierarchy; Main Memory - RAM and ROM chips, Memory Address Map, Memory Connections to CPU; Auxiliary Memory- Magnetic Disk; Cache Memory - Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization; Virtual Memory- Address and Memory Space, Address Mapping Using Pages, Associative Memory Page Table, Page Replacement.

Recommended Books:
1. M.Morris Mano: *Computer System Architecture*, 3rd Edition, Pearson Education, New Delhi (2006).
2. 2. W. Stallings: *Computer Organization & Architecture*, 9th Edition, Pearson Education, New Delhi (2012).

Third Semester
Name of Paper: Oracle Lab
Course No.: BCA/3/CC/17

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)   Credit: **3**
(0- 0- 3)

A.	**Record Book**	**(10 marks)**
B.	**Viva Voce**	**(15 marks)**
C.	**Practical**	**(50 marks)**

List of Practicals:
1. Create following Three Tables
I. Salesman

SNUM	SNAME	CITY	COMMISSION
1001	PIYUSH	LONDON	12%
1002	NIRAJ	SURAT	13%
1003	MITI	LONDON	11%
1004	RAJESH	BARODA	15%
1005	ANAND	NEW DELHI	10%
1006	RAM	PATAN	10%
1007	LAXMAN	BOMBAY	09%

SNUM: A Unique number assign to each salesman.
SNAME: The name of salesman.
CITY: The location of salesman.
COMMISSION: The salesman commission on order.

II. Customer

CNUM	CNAME	CITY	RATING	SNUM
2001	HARDIK	LONDON	100	1001
2002	GITA	ROME	200	1003
2003	LAXIT	SURAT	200	1002
2004	GOVIND	BOMBAY	300	1002
2005	CHANDU	LONDON	100	1001
2006	CHAMPAK	SURAT	300	1007
2007	PRATIK	ROME	100	1004

CNUM: A Unique number assign to each customer.
CNAME: The name of customer.
CITY: The location of customer.
RATING: A level of preference indicator given to this customer.
SNUM: A salesman number assign to this customer.

III. Orders

ONUM	AMOUNT	ODATE	CNUM	SNUM
3001	18.69	10/03/99	2008	1007

3002	767.19		10/03/99	2001		1001
3003	1900.10	10/03/99		2007	1004	
3004	5160.45	10/03/99		2003	1002	
3005	1098.25	10/04/99		2008	1007	
3006	1713.12	10/04/99		2002	1003	
3007	75.75	10/05/99		2004	1002	
3008	4723.00	10/05/99		2006	1001	
3009	1309.95	10/05/99		2004	1002	
3010	9898.87	10/06/99		2006	1001	

1.List of all orders for more than Rs. 1000

2. List all customers whose name begins with a letter 'C'

3. Count all Orders of 10th March 1999

4.List all customers serviced by salesman with commission above 12%.

5.Produce the name and rating of all customers who have above average orders.

6. Double the commission of all salesmen of London

7.Calculate the total of orders for each day.

8. Create a view called Big orders which stores all orders larger than Rs. 4000.

9. Create a view that shows all the customers who have the highest ratings.

10. Remove all orders of customer Chandu from the Orders table

2. Consider the Insurance database given below. The primary keys are underlined and the data types are specified:

PERSON	(<u>driver-id</u>:string,name:string,address:string)
CAR	(<u>Regno</u>:string,model:string,year:int)
ACCIDENT	(<u>report-number</u>:int,date:date,location:string)
OWNS	(<u>driver-id</u>:string,regno:string)
PARTICIPATED	(<u>driver-id</u>:string,<u>regno</u>:string,<u>report-number</u>:int,damage-amount:int)

1. Create the above tables by properly specifying the primary keys and the foreign keys
2. Enter at least five tuples for each relation
3. .Demonstrate how you
   a) update the damage amount for the car with a specific regno in accident with
   b) report number 12 to 25000
   c) add a new accident to the database
4. Calculate the total damage amount
5. Find the lowest and highest amount of money spent in accident.
6. Select location of accident using subquery.
7. Find the total number of people who owned cars that were involved in accidents in 2002.
8. Find the number of accidents in which cars belonging to a specific model were involved.
9. Create a VIEW called OWNERSHIP that will appear the following :
   Driver name, address, registration and location
10. Remove the model column from the CAR table.

3. Consider the following relations for an order processing database applications in a Company

CUSTOMER	(cust:int,cname:string,city:string)
ORDER	(order:int,odate:date,cust:int,ord-amt:int)
ORDER_ITEM	(order:int,item:int,qty:int)
ITEM	(item:int,unitprice:int)
SHIPMENT	(order:int,warehouse:int,ship-date:date)
WAREHOUSE	(warehouse:int,city:string)

1. Create the above tables by properly specifying the primary keys and the foreign keys
2. Enter at least five tuples for each relation
3. Produce a listing: CUSTNAME,# of orders, AVG_ORDER_AMT, where the middle column is the total no of orders by the customer and the last column is the average order amount for that customer
4. List the order # for orders that were shipped from all warehouses that the company has in a specified city
5. Demonstrate how you delete item #10 from ITEM table and make the field null in the ORDER_ITEM table.
6. List the orders date, items and unit price.
7. Calculate the total of orders for each day.
8. Find out which unit price is lowest.
9. Create a VIEW called Big which show all orders larger than ` 2000
10. Select unit price in order processing using subquery

4. Consider the following database of student enrollment in courses and books adopted for each course

STUDENT	(regno:string,name:string,major:string,bdate:date)
COURSE	(course:int,cname:string,dept:string)
ENROLL	(regno:string,course:int,marks:int)
BOOK_ADOPTION	(course:int,sem:int,book-ISBN:int)
TEXT	(book-ISBN:int,book-title:string,publisher:string,author:string)

1. Create the above tables by properly specifying the primary keys and foreign keys
2. Enter five tuples for each relation
3. Demonstrate how you add a new text book to the database and make this book be adopted by some department
4. Produce a list of text books in alphabetical order for courses offered by BCA department that use more than two books
5. List any department that has all its adopted books published by a specific publisher
6. Select marks of the student using sub query.
7. List out student marks in ascending order
8. Add new column position in enroll table
9. Create a view Black Market that gives the count of no. of publisher.
10. Delete the student bdate from the student table.

5. The following tables are maintained by a book dealer

AUTHOR	(author-id:int,name:string,city:string,country:string)
PUBLISHER	(publisher-id:int,name:string,city:string,country:string)
CATALOG	(book-id:int,title:string,author-id:int,publisher-id:int,category-id:int,year:int,price:int)
CATEGORY	(category-id:int,description:script)
ORDER-DETAILS	(order-no:int,book-id:int,quantity:int)

1. Create the above details by properly specifying the primary keys and foreign keys
2. Enter at least five tuples for each relation
3. Find the author of the book which has maximum sales
4. Demonstrate how you increase the price of books published by a specific publisher by 10%
5. List all authors whose name begins with a letter 'L'.
6. Select the price and author using subquery.
7. Select the order detail ordered by quantity.
8. Shows the total and average quantity of book order
9. Create a view called Booking which shows author name, book id, price, and year
10. Delete the quantity of book orders.

6. Consider the following database for a banking enterprise

BRANCH	(branch-name:string,branch-city:string,assets:real)
ACCOUNT	(accno:int,branch-name:string,balance:real)
DEPOSITOR	(customer-name:string,accno:int)
CUSTOMER	(customer-name:string,customer-street:string,city:string)
LOAN	(loan-number:int,branch-name:string,loan-number-int)
BORROWER	(customer-name:string,customer-street:string,city:string)

1. Create the above tables by properly specifying the primary and foreign keys
2. Enter 5 tuples for each relation
3. Find all the customers who have at least two accounts at the main branch
4. Find all the customers who have an account at all the branches located in a specified city
5. Find the average loan taken by each customer in any branch
6. Select the borrower name and balance using sub query.
7. Find the lowest and highest balance in account table.
8. Find the customer Sanjit take loan from the Noida branch.
9. Create a view called Personal loan that shows customer name, account no and loan
10. demonstrate how you delete all account tuples at every branch located in a specified city

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

Third Semester
Name of Paper: Data Structure using C Lab
Course No.: BCA/3/CC/18

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **3**
                                                                  (0- 0- 3)

A. Record Book (10 marks)
B. Viva Voce (15 marks)
C. Practical (50 marks)

1. Write a C Program to create a Sequential file with at least 4 records, each record having the shown below.
        Roll No: Non zero positive integer.
        Student Name : Character string of length 25
        Marks 1,Marks 2, Marks 3: Positive Integer
2. Write a C Program to convert and print a given valid parenthesized infix arithmetic expression to postfix expression. The expression consist of single character operands and the binary operator +,-,* and /

3. Write a C Proram to construct a Stack of integers and to perform the following operations on it.
        1. Push
        2. Pop
        3. Display
The program should print appropriate messages for stack overflow, stack underflow and stack empty
4. Write a C Program to simulate the working of a queue of integers using an array. Provide the following operations.
        1.Insert
        2.Delete
        3.Display

5. Write a C Program to simulate the working of a circular queue of integers using an array. provide the following operations.
        1.Insert
        2.Delete
        3.Display
6. Write a C program to implement linear search.
7. Write a recursive C Program for
        1. Searching an element on a given list of integers using the Binary Search method.
        2. Solving the Tower of Hanoi problem Q9. Write a C program using Selection Sort
8. Write a C program using Merge Sort
9. Write a C program using bubble Sort
10. Write a C program using insertion Sort
11. Write a C program using quick Sort
12. Write a C Program to construct singly linked list and perform the following operations:
        1.insert(first, middle, last position)

   2.delete(first, middle, last position)
   3.Display
13. Write a C Program to construct doubly linked list and perform the following operations:
   1.insert(first, middle, last position)
   2.delete(first, middle, last position)
   3.Display
14. Write a C Program to construct circular linked list
   1.insert
   2.delete)
   3.Display

15. Write a C Program using dynamic variables and pointers to construct a stack of integer using linked list and to perform the following operations:
   1.Push
   2.Pop
   3.Display
The program should print appropriate messages for stack overflow, stack underflow and stack empty
16. Write a C Program
   1. To construct a binary search tree of integers.
   2. To traverse the tree using all the methods i.e, inorder, preorder and postorder
   3. To display the elements in the tree.
17. Write a recursive C Program for
   1. Searching an element on a given list of integers using the Binary Search method.
   2. Solving the Tower of Hanoi problem

Note: *The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary*

Fourth Semester
Name of Paper: Environment and Ecology
Course No.: BCA/4/CC/19

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
(3- 1- 0)

1. **Introduction.**
   Scope and importance-multidisciplinary nature of environmental studies
   Ecology-concept, classification and ecological levels of organization
   Ecosystem-concept, types, classification and components of an ecosystem
   Structure and function of an ecosystem

2. **Natural Resources**
   Introduction, classification of natural resources
   Basics of renewable resources
   Basics of non-renewable resources
   Causes for depletion and conservation measures of natural resources

3. **Biodiversity and Conservation**
   Definition, pattern and levels of biodiversity
   Concept of mega-diversity and hotspot of biodiversity
   Causes and consequences' of biodiversity
   Conservation of biodiversity – *in-situ and Ex-situ*

4. **Environment Pollution**
   Basic concept and types of environmental pollution
   Sources and causes of environmental pollution (air, water, soil, noise)
   Effects and control measures of environmental pollution (air, water, soil, noise)
   Climate change-global warming, ozone layer depletion, acid rain and impact on human.
   Communities and agriculture

5. **Social Issues, Environment and Development**
   Goals, objectives and guiding principles of environmental education
   Environmental movements- Chipko, Appiko, Silent Valley projects.
   Roles of NGOs in environment development
   Concept of sustainable development.

   Suggested Readings:

   1. Asthana, D.K. and Asthana, M.(2010): *A Text Book of Environmental Studies*. S. Chand and Company, New Delhi.
   2. Bharucha, E.(2013): *Text Book of Environmental Studies*. University Press (India) Pvt Ltd,.Hyderabad.
   3. Daniel, D.C. (2014): *Environmental Science.* Jones and Bartlett Publishers, London

Fourth Semester
Name of Paper: Web Programming
Course No.: BCA/4/CC/20

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                              (3- 1- 0)

Unit 1 - Basics of PHP
Introduction to PHP – what does PHP Do? – a brief history of PHP – language basics – lexical structure – data types – variables – expressions and operators – flow control statements – including code – embedding PHP in web pages.

Unit 2 - Functions & Strings
Functions & Strings: Calling a function – defining a function – variable scope – function parameters – return values – variable functions – anonymous functions- User defined function, Strings: Accessing individual characters – cleaning strings – encoding and escaping – comparing strings – manipulating and searching strings – regular expression.

Unit 3 - Arrays & Objects
Arrays and Objects : Indexed Vs associative arrays – identifying elements of an array – storing data in arrays – multidimensional arrays – extracting multiple values – converting between arrays and variables – traversing arrays – sorting. Objects: Creating an object – accessing properties and methods – declaring a class – introspection.

Unit 4 - MySQL An Overview
Introduction – connecting to and disconnecting from the server – Entering queries – Creating and using a database – Creating and selecting a database – creating a table – loading data into a table – Retrieving information from a table – selecting all data – selecting particular rows – selecting particular columns – sorting rows – date calculations – working with NULL values – pattern matching – counting rows – using more than one tables.

Unit 5 - MySQL Databases In PHP
 Introduction – connecting to a MySQL database – querying the database – Retrieving and displaying the results – modifying data – deleting data, SQL injection, Backing up and restoring MySQL database managing users and privileges, Designing simple applications

Recommended Books
1. Rasmus Lerdorf, Kevin Tatroe, Bob Kaehms, Ric McGredy (2002), *Programming PHP*, O'Reilly(SPD). (Unit I,II & III)
2. Lee Babin, Nathan A. Good, Frank M. Kromann, Jon Stephens (2005), *PHP 5 Recipes, A Problem Solution ASpproach*, Après.(Unit IV & V)
3. Vikram Vaswani (2008), *PHP: A Beginner's Guide*, McGraw-Hill

Fourth Semester
Name of Paper: Computer Networking- I
Course No.: BCA/4/CC/21

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                            (4- 1- 0)

Unit 1 : Basic Concept of Networking :   (10 L)
Introduction, Components of network:- Computer Networking (Advantages, Types of network), Connecting devices: Bridges, Repeaters, Switches, Routers, Modem, Gateway, Hub, Wifi-routers
.
Client/Server Method of Connecting Computers, Physical structure and topology, categories of network, OSI model, TCP/IP protocol suite. Data and signals: Analog and digital signal, transmission impairment, performance.

Unit 2 : Physical layer: (10 L)
Transmission Media: Guided Media, Unguided Media, Digital and analog transmission: Digital to analog conversion (ASK,FSK,PSK), Analog to digital conversion (only PCM).
Multiplexing: FDM, WDM, and TDM. Switching: Circuit switch network, datagram network.

Unit 3 : Data Link Layer :   (10 L)
Introduction **:** Error detection and correction, Linear Block code **:**Simple parity check code, hamming codes, CRC. Flow and error control: Stop and wait, Stop-and-Wait ARQ, Go-Back-N ARQ and Selective repeat ARQ. PPP (framing, transition phase only).

UNIT 4 : Network and Transport Layer :   (10 L)
Network Layer: Introduction, IPv4 overview, IPv4 and IPv6 address, Network address translation, Network Management, Network Elements, ICMP. Routing algorithms- Flooding, Distance-vector routing, link state routing.
Transport layer: function, process to process delivery, UDP operation, TCP (feature, segment, connection establishment and termination).

Unit 5: Application layer and LAN's: (10 L)
Application layer: DNS, TELNET, E-mail, FTP, WWW (only architecture), HTTP, RTP.
LAN: Ethernet (Standard, Fast and Gigabit Ethernet), IEEE 802.11 (Architecture, MAC sublayer), Bluetooth (Architecture, layer), Subnetting.

Recommended Books:

1.   Behrouz A Forouzan: *Data Communication and Networking*, 4th Edition, Tata Mc Graw Hill Publication (2006)
2.   Andrew S. Tanenbaum: *Computer Networks*, Prentice Hall Publication , 5 edition (2010)
3.   Alberto Leon-Garcia and Indra Widjaja: *Communication Network*, 2nd Edition, Tata Mc Graw Hill Publication (2003)
4.   William Stalling: *Data and Computer Communication*, 10th Edition, Prentice-Hall India Publication (2013)

Fourth Semester
Name of Paper: Object Oriented Programming in C++
Course No.: BCA/4/CC/22(a)

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
(3- 1- 0)

Unit-1:   (**10 L**)
Principle of OOP & Elements of C++ : Basic concepts of OOP, comparison of procedural programming and OOP, advantages of OOP. Definitions: Class, objects, concept of inheritance and encapsulation, operator overloading, dynamic binding. Basic program construction. Tokens and identifiers. Variables and constants. Data types. Console I/O. Control statements.

Unit-2:   (**10 L**)
Function, Classes and Objects: Declaration of functions, calling functions, function definition, passing arguments and returning values. Return statement, types of functions, passing and returning structure variables. Overloaded functions, inline functions, default arguments, returning by reference; Declaration of classes and objects, class definition, declaration of members, object as date time, object as function arguments, arrays of objects, returning objects from function, structures and classes.

Unit-3:   (**10L**)
Constructors and Destructor, Operator Overloading: Basic constructor, parameterized constructors, constructor with default arguments, dynamic initialization of objects, use of copy constructor, dynamic constructors. Destructors, constraints on constructors and destructors. Overloading unary operators, overloading binary operators, rules for overloading operators

Unit-4   (**10 L**)
Derived Classes & Inheritance, Pointers, Virtual Function: Derived classes and base class, Class hierarchies. Inheritance, different types of inheritance, Virtual base class, Constructors in derived class. Addresses and pointers, pointers and functions, pointers and array, pointers and string, memory management using new and delete operators. Pointers to pointers, pointers to objects. Virtual Function and polymorphism, friend function.

Unit-5:   (**10 L**)
Streams, Exception Handling, Class Libraries: Stream class hierarchy, header files, ios flag, File streams, classes for file stream operations, opening and closing a file, working with single file, working with multiple files, detecting end of file, file modes, file pointers, error handling during file operations, command line arguments. Exception handling-try, catch, throw statement. Templates- Generic functions, generic class, template functions. STL, components of STL: containers, algorithms and iterators, categories of containers.

Recommended Books:
1.   E Balagurusamy: *Object-Oriented Programming with C++,* 2nd Edition, Tata McGraw Hill (2001).
2.   K.V. Venugopal, R.Kumar and T.Tavaishankar: *Mastering C++,* 1st Edition, Tata McGraw Hill. (1997)

Fourth Semester
Name of Paper: Object Oriented Programming in Java
Course No.: BCA/4/CC/22(b)

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                                          (3- 1- 0)

Unit 1: Introduction to Java   (10 L)
            1.1 Features of java
            1.2 JDK Environment & tools like(java,javac, appletviewer, javadoc, jdb)
            1.3 OOPs Concepts: Class, Abstraction, Encapsulation,Inheritance,
            Polymorphism
            1.4 Difference between C++ and JAVA
            1.5 Structure of java program
            1.6 Data types ,Variables ,Operators ,Keywords ,Naming Convention
            1.7 Decision Making (if, switch),Looping(for, while)
            1.8 Array: Creating an array,Types of Array- One Dimensional arrays
            - Two Dimensional array
            1.9 String
            - Arrays , Methods.
            - StringBuffer class

Unit 2: Classes and Objects   (10 L)
            2.1 Creating Classes and objects
            2.2 Memory allocation for objects
            2.3 Constructor
            2.4 Implementation of Inheritance: Simple, Multilevel,
            2.5 Abstract classes and methods
            2.6 Implementation of Polymorphism
            2.7 Method Overloading, Method Overriding
            2.8 Nested and Inner classes.
            2.9 Modifiers and Access Control

Unit 3:Errors ,Exceptions and File Handling: (10 L)
        Errors and Exceptions
            3.1 Introduction, Types of Errors
            3.2 Exceptions, Types of Exception
            3.3 Syntax of Exception Handling Code,
            Using try catch and multiple catch, Nested try, throw , throws and finally
             3.4 Creating user defined Exceptions
        File Handling
        3.5 Stream: ByteStream Classes; CharacterStream Classes
        3.6 File IO basics
        3.7 File operations
            Creating file
            Reading file(character, byte)
            Writing file (character, byte)

Unit 4: Packages and Interfaces File Handling   **(10 L)**

> 4.1 Packages
>> Packages Concept
>> Importing Packages
>> Types of Packages
>> Creating user defined packages
> 4.2 Wrapper Class

Interfaces

> 4.3 Defining Interfaces
> 4.4 Extending Interfaces
> 4.5Implementing Interfaces
> 4.6 Nested Interfaces
> 4.7 Accessing Interface variables

Unit 5:   Applet, AWT and Swing Programming   **(10 L)**

Applet

5.1 Introduction

5.2 Types of applet

5.3 Applet Life cycle

> - Creating applet
> - Applet tag

5.4 Applet Classes

> - Color
> - Graphics
> - Font

AWT

5.5 Components and container used in AWT

5.6 Layout managers

5.7 Listeners and Adapter classes

5.8 Event Delegation model

Swing

5.9 Introduction to Swing Component and Container Classes

Recommended Books:

1. E Balugurusamy: *Programming with JAVA, A primer*, McGraw Hill Education
2. Herbert Schildt: *The Complete Reference,–JAVA*. 9th Edn.

Fourth Semester
Name of Paper: Web Programming using PHP Lab
Course No.: BCA/4/CC/23

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **3**

(0- 0- 3)

A. Record Book (10 marks)
B. Viva Voce (15 marks)
C. Practical (50 marks)

List of Experiments
1. XAMPP or WAMP installation, php syntax, comments, echo and print, Variables, PHP constants, Data types and operators.
2. PHP control Structures: if, else-if, Nested If-else, Switch Case.
3. PHP Loop: For loop, Foreach loop, While loop and Do-while loop.
4. PHP forms: GET, POST, FORM methods. Extract()
5. File Handling: File READ and WRITE, Create Image gallery in PHP.
6. File upload and File Download
7. State Management: PHP Cookies, PHP Sessions
8. Array in PHP: Index, Associated, Nested Array. Array Functions.
9. PHP Captcha: Captcha and Dynamic image Generation.
10. PHP Function and Error Handling: Local and Global and static variables, parameterized function, recursive, function parameters. Fatal Error and Warning Error
11. PHP String , String manipulation and PHP Numeric, PHP Mathematics, PHP Object Oriented
12. PHP and MYSQL (DATABASE, CONNECT, CREATE,SELECT, INSERT, WHERE, DELETE, JOINT, ORDER-BY)
13. Create a PHP page to load dynamic text using AJAX get/post
14. Create a simple webpage using PHP.
15. Creating simple applications using PHP and Mysql
16. PHP user defined functions

Note: The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary

Fourth Semester
Name of Paper: C++ Programming Lab
Course No.: BCA/4/CC/24(a)

Marks Scale: **100** marks (End Sem. Exam: 75+Internal: 25)   Credit: **3**
                                                                  (0- 0- 3)

A. Record Book   **(10 marks)**
B. Viva Voce   **(15 marks)**
C. Practical   **(50 marks)**

List of Programs to be experiment in the Lab:
1. Write a program to define a class and to create an object of it.
2. Write a program to declare static data members and static member functions of a class.
3. Write a program to create an array of objects of a class.
4. Write a program to demonstrate how to pass an object as argument to a function and return the same object.
5. Write a program to demonstrate inline function concept.
6. Write a program to demonstrate friend function concept.
7. Write a program to demonstrate virtual function concept.
8. Write a program to demonstrate working of function overloading.
9. Write a program to demonstrate working of constructor in a class.
10. Write a program to demonstrate constructor overloading in a class.
11. Write a program to demonstrate concept of copy constructor of a class.
12. Write a program to demonstrate concept of destructor of a class.
13. Write a program to demonstrate how to overload unary operator.
14. Write a program to demonstrate how to overload binary operator.
15. Write a program to demonstrate conversion from one class to another class.
16. Write a program to demonstrate single inheritance concept.
17. Write a program to demonstrate multilevel inheritance concept.
18. Write a program to demonstrate multiple inheritance concepts.
19. Write a program to demonstrate importance of virtual base class.
20. Write a program to demonstrate working of Abstract class.
21. Write a program to demonstrate working of constructors in a derived class.
22. Write a program to demonstrate "this" pointer uses.
23. Write a program to demonstrate basic file operations like open, read, write and close.
24. Write a program to demonstrate how to update a file using random access.
25. Write a program to demonstrate exception handling mechanism.
26. Write a program to demonstrate bubble sort using template function**.**

Note: The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary

Fourth Semester
Name of Paper: Java Programming Lab
Course No.: BCA/4/CC/24(b)

Marks Scale: **100** marks (End Sem. Exam: 75 + Internal: 25)   Credit: **3**
                                                                                                     (0 - 0- 3)

A. **Record Book**   **(10 marks)**
B. **Viva Voce**   **(15 marks)**
C. **Practical**   **(50 marks)**

Guidelines:
  ➢ The output of the programs should be neatly formatted.
  ➢ The source code should be indented.
  ➢ The programs need to be interactive.
  ➢ Data validations can be done wherever applicable.
  ➢ Include comments to improve the readability of the program.

Use meaningful variable names
  1) Demonstrating the use of methods of Math class.
  2) Programs to implement the methods of String class
  3) Write a program to demonstrate constructors and constructors overloading.
  4) Write a program to demonstrate method overloading.
  5) Write a program to demonstrate method overriding.
  6) Write a program to demonstrate abstract class.
  7) Write a program to demonstrate interfaces.
  8) Write a program to demonstrate inheritance.
  9) Write a program to demonstrate **super** and **this** keywords.
  10) Write a program to demonstrate static variables and methods.
  11) Write a program to demonstrate Exceptions Handling
  12) Write a program to demonstrate FileInputStream and FileOutputStream Classes.
  13) Write a program to demonstrate the creation and accessing of packages.
  14) Write a program to demonstrate the creation and accessing of applets.
  15) Write a program to demonstrate Mouse and Keyboard events in applets.
  16) Write a program to demonstrate the creation of a frame.
  17) Write a program to demonstrate Labels and Buttons with proper events.
  18) Write a program to demonstrate Checkboxes with proper events.
  19) Write a program to demonstrate CheckBoxGroups with proper events.
  20) Write a program to demonstrate Lists and TextFields with proper events.
  21) Write a program to demonstrate ScrollBars with proper events.
  22) Write a program to demonstrate MenuBars and Menus.
  23) Write a program to demonstrate Dialog boxes.
  24) Write a program to demonstrate Calculator.

Note: The above lists of experiments are suggestive of the standard. Department may modify,
add or delete any experiment whenever it considered necessary

Fifth Semester
Name of Paper: Software Engineering-I
Course No.: BCA/5/CC/25

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                                                          (4- 1- 0)

Unit-1   **(10 L)**
Software Engineering: Definition, Software Process**,** Software characteristics, The changing Nature Of Software.
Software Life Cycle Models: Build and Fix Model, Waterfall Models, Increment Process Models: Iterative enhancement Model, Rapid Application Development (RAD) Model, Evolutionary Process Models: Prototyping Model, Spiral Model.

Unit-2   **(10 L)**
Software Requirements analysis & specifications: Requirements engineering, Types, Feasibility Studies. Software Prototyping.   Requirement elicitation techniques like Interviews, Brainstorming, FAST, QFD, Use case approach. Requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation Nature of SRS, Characteristics & organization of SRS. Requirement Validation & Management.

Unit- 3   **(10 L)**
Software Design: Definition and objectives. Modularity: Coupling & Cohesion. Strategy of Design: Hybrid, Bottom-Up & Top-Down. Function Oriented and Object Oriented Design.

Unit-4   **(10 L)**
Software Metrics: Definition. Token Count, Data Structure Metrics, Information Flow Metrics.
Software Project Planning: Size Estimation: LOC & Function Count, Cost Estimation: COCOMO. Software Risk Management.

Unit-5   **(10 L)**
Software Testing: Definition and software Testing Fundamental, Verification and Validation, Alpha, beta and Acceptance Testing, Black box testing, White Box testing, Levels of testing, Debugging.
Software Reliability: Basic Concept, Software and Hardware Reliability, Failure and Faults, Software Quality Attributes.
Software Maintenance: Definition, Categories of maintenance, Maintenance Process. Reverse Engineering, Software Re-engineering, Documentation.

Recommended Books:

1.   R. Pressman: *Software Engineering,* McGraw-Hill Science/Engineering/Math; 7 edition (2009)
2.   K. K. Agarwal and Y. Singh: *Software Engineering,* New Age International (2005)

Fifth Semester
Name of Paper: Computer Graphics
Course No.: BCA/5/CC/26

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **4**
                                                                                            (3- 1- 0)

Unit 1:
Introduction: History of computer graphic, History of Computer Graphics, What is CG, Types of Computer Graphics, Area of Computer Graphics, Overview of Graphics Systems:
Video Display Devices, Refresh Cathode Ray Tubes, Raster-Scan and Random-Scan Systems, Input Devices, Hard-Copy Devices and Graphics Software.

Unit 2:
Output Primitives: Points, Line Drawing Algorithms (DDA and Bresenham's Line Drawing Algorithm), Circle- Generating Algorithms (Bresenham's and Midpoint Circle Algorithms), Ellipse-Generating Algorithms(Midpoint Ellipse Algorithm only), Filled- Area Primitives: Scan –Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm.

Unit 3:
Two Dimensional Geometric Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shear, Transformations between Coordinates Systems, Raster Methods for Transformations.
Two-Dimensional Viewing: The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-View Port Coordinate Transformation, Clipping- Point, Line(Cohan-0Sutherland Line Clipping and Liang –Barsky Line Clipping and Nicholl-Lee-Nicholl Line Clipping) and Polygon Clipping (Sutherland- Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping).

Unit 4:
Three Dimensional Geometric Transformations: Translation, Rotation, Scaling, Reflection and Shears, Composite Transformations, Modeling and Coordinate Transformations.
Three Dimensional Viewing: Viewing Pipeline, Viewing Coordinates, Projections and Clipping.

Unit 5:
Multimedia Systems Design: Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Data Interface Standards, the Need for Data Compressions, Multimedia Database.
Media and Data Streams: Medium, Main Properties of a Multimedia Stream, Multimedia System Definition, Combination of Media.
Data & File Format Standards: Rich –Text Format, TIFF File Format, RIFF, MIDI File Format, JPEG DIB File Format, MPEG Standards.

Reco0mmended Books:
1. D. Hearn & M. P. Baker - *Computer Graphics C Version*, 2nd Edn,Pearson Education, New Delhi, 2006
2. J. F. Koegel Buferd -*Multimedia Systems*, Pearson Education, New Delhi, 2006

Fifth Semester
Name of Paper: GUI Programming
Course No.: BCA/5/CC/27

Marks Scale: **100** marks (End Sem. Exam: 75 + Internal: 25)   Credit: **4**
                                                                                                             (3 - 1 - 0)

Unit 1   (10L)
An overview of the .NET framework, Common Language Runtime (CLR), The .Net Framework Class Library, Code Loading and Execution, Common Type System (CTS), Common Language Specification (CLS), MSIL. Introduction to .NET Architecture, Event-Driven Programming, Integrated Development Environment (IDE) for VB.Net, Introduction to VB.NET – basic syntax, Identifiers, Keywords, Data types, Type conversion, Variables, Constants and Enumerations, Statements, Operators.

Unit 2   (10 L)
Working with simple applications and complex applications, Working with Forms: Textbox, Label, Button, ListBox, ComboBox, CheckBox, PictureBox, RadioButton, Panel, Timer, ListView, TreeView, DateTimePicker, LinkLabel, Methods and Events, Event Handling.
Dialog Boxes: OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog.
Designing menus: MenuStrip, ContextMenuStrip, Access & Shortcut keys.

Unit 3   (10 L)
Decision Making: Looping statements, Strings, Arrays, VB.NET – Collections.
Procedures and Functions: Defining a function, Function returning a value, Recursive function, Param Arrays, Passing Arrays as functions arguments, Defining Sub Procedures, Passing parameters by Value, Passing parameters by Reference.
Major Error Types: Syntax, Execution and Logic errors. Exception, Exception handling, ureating user-defined Exceptions.

Unit 4   (10 L)
Introduction to object oriented programming, Classes and Objects, Defining a Class, Inheritance, Methods and Properties, Method Overloading and Method Overriding, Constructors and Destructor, Interface.
Access modifiers: Public, Private, Protected, Friend. Using namespace, using imports statement, creating class library.

Unit 5   (10 L)
Introduction to database access, overview of ado.net, ado.net architectures and its components, Data Provider: Command, Connection, Data Reader, Data Adapters, Data Set: Data Table Collection, Data Relation Collection, Extended Properties, Data Tables, Data Relation, Data Row Collection, Data View, Primary Key, Data Columns, Data Rows, Data Column Collection, Connecting to a Database, Working with Data Grid View, Reporting using Report Viewer, Data binding with textbox, data grid, Binding Source Navigator.

Recommended Books:
 1. Thearon Willis, Bryan Newsome: *Beginning Microsoft Visual Basic 2010*, Wiley India Pvt. Ltd. (2012).
 2. Evangelos Petroutsos: *Mastering Microsoft Visual Basic 2010*, Wiley India Pvt. Ltd. (2010).
 3. http://www.tutorialspoint.com/vb.net/vb.net_quick_guide.htm

Fifth Semester
Name of Paper: Elective-I (any one)
Course No.: BCA/5/EC/28
a) Cloud Computing

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                                (4- 1- 0)

Unit - 1
Understanding Cloud Computing: Origin and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges.

Unit - 2
Fundamental Concepts and Models: Roles and Boundaries, Cloud characteristics, Cloud Delivery Methods, Cloud Deployment Models.

Unit - 3
Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

Unit - 4
Fundamental Cloud Security: Basic Terms and Concepts, Threat Agents, Cloud Security Threats.

Unit - 5
Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication.

Recommended Books:
1. Thomas Erl: *Cloud Computing: Concepts, Technology & Architecture, 1st Edition*, Pearson (2013).
2. Raj Kumar Buyya, James Broberg, Andrjez M. Goscinski: *Cloud Computing: Principles and Paradigm*, Wiley(2013).
3. Dinkar Sitaram, Geetha Manjunath: *Moving to The Cloud*, Elsevier (2012)

Fifth Semester
Name of Paper: Elective-I (any one)
Course No.: BCA/5/EC/28
b)E-commerce and E-governance

Marks Scale: 100 marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                          (4- 1- 0)
Unit – 1   **(10 L)**
Internet and Commerce: Business operations; E-commerce practice vs. traditional business practice; Concepts b2b, b2c, c2c, b2g, g2h, g2c; Benefits of e-commerce; Limitation of E-commerce Management issues relating to e-commerce.
Operations of E-commerce: Credit card transaction; Secure Hypertext Transfer Protocol (SHITP); Electronic Payment System; Secure Electronic Transaction (SET); SET's encryption; Process; Cybercash; Smart Cards; Indian Payment models.
Unit-2:   Applications in B2C: (10L)
Consumers' shopping procedure on the internet; Impact on dis-intermediation and re-intermediation; Global market; Strategy of traditional department stores; Products in b2c model; Success factors of e-brokers; Broker-based services online; Online travel tourism services; Benefits and Impact of e-commerce on travel industry; real estate market; Online stock trading and its benefits; Online banking and its benefits; Online financial services and their future; E-auctions-benefits, implementation, and impact.
Unit-3:   Applications in B2B :   **(10L)**
Applications in B2B: Application of b2b; Key technologies for b2b; Architectural models of b2b; Characteristics of the supplier-oriented marketplace, buyer-oriented marketplace, and intermediary-oriented marketplace; Benefits of b2b on procurement reengineering; Just in Time delivery in b2b; Internet-based EDI from traditional EDI; Integrating EC with back-end information systems; marketing issues in b2b.
Unit 4: Introduction to e-Governance   **(10 L)**
E-Governance: Needs of E-Governance, Issues in E-Governance applications and the Digital Divide; Evolution of E-Governance, Its scope and content, components of e-Governance, Present global trends of growth in E-Governance, Areas of e-Government, Benefits of E-Governance, E-Governance Vrs E-Government, Critical success and failure factors for e-Governance. Role of social Media in e-Governance.
Unit 5: E-Governance Models   **(10L)**
Introduction, Models of Digital Governance: Broadcasting Dissemination Model, Critical Flow Model, Comparative Analysis Model, Mobilization and Lobby Model, Interactive-Service Model, E-governance Maturity Model, principle, applications and evaluation of each model. Characteristics of Maturity levels, Key Focus areas, towards good Governance through E-Governance models

Recommended Books:

1. Efraim Turban, Jae Lee, David King, H.Michael Chung, *Electronic Commerce–A Managerial Perspective*, Addison-Wesley.
2. C.S.R. Prabhu: *E-Governance: Concepts and Case Studies*, Prentice-Hall of India Pvt. Ltd. (2004).

Fifth Semester
Name of Paper: Elective-I (any one)
Course No.: BCA/5/EC/28
c) IT Act and Cyber Laws

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                                                                        (4- 1- 0)

Unit 1 :   **(10 L)**
Basic Concepts of Technology and Law : Definition Cyber Law, cyber law: Cyber-crimes, electronic & Digital Signature, Intellectual property, Data protection and privacy, Scope and needs of Cyber Laws, The jurisprudence of Indian Cyber Law.

Unit 2:   **(10 L)**
Evolution of cyber-crime, Cyber Fraud and Cyber Cheating, Virus on the Internet, Email spoofing, E-mail bombing, cyber stalking, Denial of service attracts, cyber Terrorism, Salami attack, Online gambling, Sale of illegal articles, Internet time theft, Web jacking, Data diddling, Intellectual Property crimes, Web defamation, Cyber Pornography.

Unit 3 :   **(10 L)**
Law of Digital Contracts: The essence of Digital Contracts, The system of Digital signatures, Digital Signature Certificates, Certifying Authorities and Liabilities, The role and function of certifying authority.

Unit 4 :   **(10 L)**
E-Governance and IT Act 2000 & Amendments: Legal recognition of electronic records, Legal recognition of digital signature, Use of electronic records and digital signatures in Government and its agencies.
Information technology Act 2000: Object and Scope of the IT Act: Genesis, Object, and Scope of the Act. Major issues address by the IT Act, Extend and jurisdiction of IT Act, Applicability of IT Act, and Relevant Authorities in India.

Unit 5:   **(10 L)**
Copyright: Meaning, Ownership and Assignment, Licence of Copyright, Copyright Protection of Content on the Internet.
Management Issues: Organizational Issues
Introduction, Cyber law: Management issues, Cyber law: Organizational issues, Jurisdictional issues, Online Dispute Resolution (ODR)

Recommended Books:
1. Farooq Ahmad: *Cyber Law in India*- Pioneer Books.
2. Vivek Sood: *Cyber Law Simplified*, Tata McGraw Hill.
3. Vakul Sharma: *Information Technology Law and Practice* – Universal Law Pub. Co. P. Ltd.
4. Suresh T Vishwanathan: *The Indian Cyber Law* –Bharat Law House New Delhi.
5. The Information Technology Act, 2000 – Bare Act –Professional Book Publishers – New Delhi.

Fifth Semester
Course No.: BCA/5/CC/29
Name of Paper: Minor Project

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **3**
                                                                                          (0-0-3)

Introduction
The BCA students are encouraged to involve themselves on this minor project. It is advised to students to develop their own project for solving different types application developments. Doing this will give more exposure to handle real life problems of project development. The hands on experience gained from the practical classes provide students the knowledge to work with software developments in variety of application domains.

From the beginning of selecting a topic to completing this minor project, the teacher in-charge is expected to give guidance to student wherever necessary. The teacher is expected to explain and refresh the minds of students regarding different topics relation to project development such as Software Requirements Specifications, Entity Relationships diagrams, Data Flow Diagrams, components and procedure for writing project report, etc. But majority of the minor project classes will be devoted for the students to do their practical project works.

The primary emphasis of the minor project work is to understand and gain the knowledge of the principles of software engineering practices, and develops good understanding of Software Development Life Cycle. Students should take this project work very seriously. Topics selected, should be not too simple and but easy enough for the standard of BCA student. The project should be genuine and original in nature and should not be copied from anywhere else. Student must follow the different guidelines given for this minor project.

Marks Distribution
The total mark for this minor project is 100 which is divided as 75 external marks and 25 internal marks. Marks distribution for internal as well as external for this minor project is given below:

SlNo.	Topics	Marks
1	Project Development and Execution	30
2	Project Report	15
3	Presentation	20
4	Viva Voce	10
5	Internal mark (including attendance)	25
	TOTAL	**100**

Note: The internal marks 25 includes marks to be given based on attendance or regularity of the class and any other methods of assessments such as test, presentations, etc. can be adopted by the teacher for rewarding the internal mark.

Grouping
This is the first project work for BCA students and therefore each individual student is expected to carry out their own Minor project work which is not too complex but easy enough to be able complete a student. But the minor project should be not too simple and must be of at the level of

BCA standard. Under certain cases, if students want to work in group, *maximum of 3(three) students will be allowed to work in a single project*. But each student must take part in all the different phases this minor project development. Any member of the group, not taking part in the project development may be rewarded negatively.

Schedule

The teachers must give time frame or calendar for the minor project. This should be done after completing theoretical explanation of the minor project development process including SRS, SDLC, etc. The time frame or calendar for minor project should be display on notice and websites by the teacher concern. The format of the calendar for minor project is given below:

SlNo	Topics	Date / Last Date
1	Submission of Project Synopsis	
2	Approval of Project Proposal	
3	Submission of Project Report	
4	Project Presentation and Viva-voce	

Project Synopsis

Students must prepare project synopsis before carrying out the actual project work. The project synopsis should be submitted to the teacher and only obtaining approval from the teacher, actual work on the project can be carry on. This will avoid any redundancy in selecting the project work. Changing a project after approval can be done only in consultation with the project guide by preparing a fresh project synopsis.

The format for Project Synopsis must include the following:
  (1) Title of the project
  (2) Introduction and Objective of the project
  (3) Software Requirements for the development of the project
  (4) Students' details with signature

Project Report Format

Project report should be printed on a single sided A4 page with proper line spacing such as 1.5pt and the report must include the followings:
  1) Cover page
  2) Certificate
  3) Acknowledgement
  4) Contents
  5) Introduction
  6) Objectives
  7) Need for system
  8) Feasibility study
  9) Hardware requirement for running the software
  10) Software requirement for running the software
  11) Entity Relationship Diagrams
  12) Data Flow Diagrams
  13) Input and Output Screens along with codes
  14) Limitations of the Project

15) Future Scope of the Project
16) Bibliography

All the students must submit project report in his/her name only to the teacher and sharing of project report is not allowed. Minor project report may be spiral bind or hard bind. Besides submitting to the department, each student is expected to retain another copy of the project report for their future references.

Format of Certificate
The format of Certificate for the project is given below.

Name of the College or Institute

Institute Logo

CERTIFICATE

This is to certify that these practical records of the course "**Minor Project**" with course code *BCA/5/CC/29* submitted for the partial fulfillment of the requirement **BCA ____ Semester Examination** is an authentic and original work carried out under my supervision. Detail of student is given below:

University RollNo. _____

University RegNo. _____

Round Seal

(Name of Student)
BCA Semester : ____
Date : _____

(Name of Teacher)
Designation
Date : _____

Fifth Semester
Course No.: BCA/5/CC/30
Name of Paper: Programming with VB.NET Lab

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **3**
                                                                                                          (0- 0- 3)

A. Record Book (10 marks)
B. Viva Voce (15 marks)
C. Practical (50 marks)

1. Develop a simple windows application that can say "Hello Mr/Ms<yourname>, Welcome to Visual Basic 2010 Programming!" when the OK button is click.
2.   Write windows application with three input boxes - two for inputting numbers and one for displaying result. Perform four basic mathematical operating such as plus, minus, multiply and divide using their respective buttons.
3.   Develop console application for calculating simple interest where Simple Interest = (Principal x Time x Rate) / 100. Calculate the simple interest at least up to three decimal accuracy.
4.   Develop a console application to calculate largest and smallest number in a given array.
5.   Write a window application for login purpose with two input boxes for username and password and appropriate buttons. When the user click login button, the software will check the password with the password set by you and then display message box accordingly.
6.   Develop windows application having one combo box at the middle with at least 5 color names in it. When user selects any color from the list, the background color of the application has to change as per the selection using the select...case statement.
7.   Design a form having 1 Text box and buttons like Bold, Italic, Red & Blue, show and hide When user presses any of this command buttons then the content of text box will be changed to red or blue or bold or italic and Clicking on the "Show" button it will display a Textbox & when user clicks on "Hide" button then it will remove the Textbox.
8.   Design a digital watch using Timer Control.
9.   Write a birthday program that allow the user to enter their name, select their birthday from the calendar. Display the users name, age and the day when his/her birthday will come this year when the control is clicked.
10.   Design a form that demonstrate check box and radio button.
11.   Write a VB.Net program to design the following form, select the question number from combo box that question will be displayed into textbox and the options for that question will be displayed on four radio buttons, select option and click on submit button result should be displayed in message box.
12.   Write a VB.Net program having two textboxes, accept a character from keyboard in the textbox and check whether it is vowel or not and display the case of that character in message box. And in the next textbox, check if a text entered is an email address or not.
13.   Design a calculator program using control array.
14.   Implement a program for the demonstration of Array in Visual Basic 2010 where sorting array can be performed by the user.
15.   Create an application for the demonstration of different types of dialog controls such as Save Dialog, Open Dialog, Font Dialog, Color Dialog, Folder Browser Dialog and Print Dialog.

16.   Add status bar control to any of your existing application and display date and time on the status bar.

17.   Write a VB program for error handling.

18.   Write VB.Net application for students database with the fields (id, sname, rollno, year, department, father's name, phone no, address, passport size). Create add, delete, edit, previous and next button to navigate the record.

19.   Print all the students detail, students by department, students by year using reportviewer.

20.   Display the students detail using datagrid view.

22.   Use the above table to demonstrate databinding navigator.

23.   Write vb.net application for lecturer database with the fields (id, lect name, dob, basic salary, grade pay, da, hra, sca, total pay). Calculate da, hra, sca and total pay from basic salary and grade pay. Save the record in database and display. Use report viewer to view individual record.

24.   Add Visual Studio 2010 Setup project to your application and generate single installer and test your installer into your machine and confirm its working.

Note: The above lists of experiments are suggestive of the standard. Department may modify, add or delete any experiment whenever it considered necessary

Sixth Semester
Course No.: BCA/6/EC/31
Name of Paper: Elective-II (*any one*)
a) Software Engineering-II

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                    (4- 1- 0)

Unit 1:   **(10L)**
Software Project Planning: Introduction, Management spectrum 4P (people, process, product, project), Task set of project planning, choosing the right process: Waterfall, Prototype, Iterative Enhancement model, Rapid development Model, Unified process and Spiral models. Agility, Agile Process, Agile Process Models

Unit 2:   **(10 L)**
Object Oriented Software Engineering: Object Oriented concepts, Object Oriented Analysis: Domain analysis, OOA process, Object-relationship model, Object-behavior model, Object Oriented Design: OO design pyramid, translation of OOA to OOD, System design process, Object design process.

Unit 3:   **(10 L)**
Project Scheduling: Basic Concepts, Project Scheduling: Introduction, Tasks network, Critical Path Method, PERT, Timeline Chart, staffing, Earned Value Analysis, Cost Estimation, COCOMO (basic, intermediate and detailed) and COCOMO II Model.

Unit 4:   **(10L)**
Software Quality management: Quality concept, SQA: Background and SQA activities, Software reviews and Formal Technical Reviews, Formal approaches to SQA, Software quality model: McCall Software Quality Model, FURPS, Boehm Software Quality Model, ISO 9126, CMM, ISO 9000.

Unit 5:   **(10L)**
UML: Overview of UML, UML diagrams: Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State machine diagram, Activity diagram, Component diagram, Deployment diagram.

Recommended Books:
1. Pressman Roger S., *Software Engineering- A Practitioner's Approach*, 7th Edition, Tata McGraw Hill-2009
2. Aggarwal KK and Singh Yogesh, *Software Engineering* , 3rd Edition, New Age International Publisher-2008.
3. Pankaj Jalote, *An Integrated Approach to Software Engineering*, 3rd Edition, Narosa Publications, 2011.
4. Jibitesh Mishra, Ashok Mohanty, *Software Engineering*, 1st Edition, Pearson Education, 2011.
5. Ali Bahrami, *Object Oriented System Development*, McGraw Hill International Edition, 2008.

Sixth Semester
Course No.: BCA/6/EC/31
Name of Paper: Elective-II (*any one*)
b) Software Project Management

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                                                         (4- 1- 0)

Unit-1 10L
Introduction to Software Project Management:
Introduction, Typical project life cycle, Stepwise: An overview of project planning. Project Management Concept: People, process, project and product (4P), Project Scheduling, Project Management Tools: Gantt Chart, PERT Chart, Software Project Plan Document, System development life cycle (SDLC).
Unit-2 10L
Project teams, project monitoring and controls –
Formal Technical Review(FTR), Cost estimation – COCOMO Model, Software Metrics – Size oriented and function oriented.
Quality Management - Quality definition, quality management activity, process and product standards, documentation standards, ISO 9126 and CMM, Risk Management, Software Configuration Management (SCM)
Unit-3 10L
Software effort estimation – Introduction, Software effort estimation techniques, The top-down approach and parametric models, Expert judgement.
Quality models – MC Call's Quality Model, Boehm's Quality Model; Activity planning – Objectives, project schedules; Project and activities – Activity based approach, The product based approach, The hybrid approach, Software measurement & tacking planning – Concept in measurement, Metrics and Measurement, Process monitoring through Statistical Process Control (SPC), Life cycle of defect.
Unit-4 10L
Resource allocation – The nature of resources, Identifying resource requirements, Scheduling resources, Creating critical paths, Counting the cost, Publishing the resource schedule.
Monitoring & Control – Project control cycle, Collecting the data, Visualizing progress, Cost monitoring, Prioritizing monitoring, Change control.
Managing Contracts – Types of contract, Stages in contract placement, Contract management.
Unit-5 10L
Managing people and organizing teams – Understanding behavior, Organizing behavior, Selecting the right person for the job, Motivation, Working in groups, Becoming a team, Decision making, Leadership, Organizational structures.
Software quality – Importance of software quality, Software quality measures, Product versus process quality management, Techniques to help enhance software quality.

Recommended Books:
1. Bob Hughes and Mile Cotterell : Software Project Management, 3rd Edn, Tata McGraw Hill (2004)
2. Hughes: Software Project Management, McGraw-Hill Education, 5th Revised edition (2009)

Sixth Semester
Course No.: BCA/6/EC/31
Name of Paper: Elective-II (*any one*)
c) Management Information System

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                    (4- 1- 0)

Unit – 1 :
System concept, Data and Information, Types of information, Types of Information System at Management levels, MIS: Definition, Meaning and Role, System approach, The system view of business, MIS organization within the company, Management Organizational theory and the system approach, Development of organizational theory, Management and organizational behavior, Management, Information and the System approach

Unit – 2 :
Data Processing - Operation of Manual Information System, Components of Computer System, Conversion of Manual to Computer Based Systems, Data Bank Concept, types of computer based applications.
Evolution of an Information system, Decision making and MIS, MIS as a technique for making programmed decisions, Decision assisting information

Unit – 3:
Strategic and Project Planning for MIS
General business planning, MIS response, MIS Planning (general & detail)

Define the problem, Set system objectives, Establish system constraints, Determining information needs and sources, Develop alternative conceptual design and select one, Document the system concept, Prepare the conceptual design report

Unit – 4 :
Inform and involve the organization, Aim of detailed design, Project management of MIS detail design, Identifying the domain and tradeoff criteria, Defining subsystems, Sketch the detailed operating sub system and information flows, Determination of the degree of automation of each operation, Inform and involve the organization again, Input/Output and processing early system testing, Software, hardware & tools propose to an organization to operate the system, Documentation of the detailed design.

Unit – 5 :
Planning for the implementation, Acquiring floor space & planning space layout, Organize for the implementation, Develop procedure from implementation, Operating personal training, Computer related acquisitions, Developing forms for data collection and information, Dissemination, Developing the files, Testing the system, Cutover, Documentation of the system, Evaluation of the MIS control and the system maintenance.
Pitfalls in MIS development: Fundamental weaknesses, Soft spot planning, Design problems

Recommended Books:
1. Robert G. Murdick, Joel E. Ross and James R. Claggett: *Information Systems for Modern Management,* PHI
2. Gordan B. Devis: *Management Information System*
3. Jerome Kanter: *Managing with Information, PHI*
4. Kenneth C. Laudon: *Management Information System, PHI*

Sixth Semester
Course No.: BCA/6/EC/32
Name of Paper: Elective III (*any one*)
a) Data Warehousing

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
(4- 1- 0)

Unit - 1
The Compelling Need For Data Warehousing: Escalating need for strategic information, Failures of past Decision-Support, Operational versus Decision-Support systems, Data Warehousing—The only viable solution, Data Warehouse defined, The Data Warehousing movement, Evolution of Business Intelligence.
Data Warehouse - The Building Blocks: Defining features, Data Warehouses and Data Marts, Architectural types, Overview of the components, Meta data in the Data Warehouse.

Unit - 2
Trends In Data Warehousing: Continued growth in Data Warehousing, Significant trends, Emergence of standards, Web-enabled Data Warehouse.
Defining The Business Requirements: Dimensional Analysis, Information packages, Requirements gathering methods, Requirement definition: Scope and content.

Unit - 3
Requirements as The Driving Force for Data Warehousing: Data design, The architectural Plan, Data storage specifications, Information delivery strategy.
Architectural Components: Understanding Data Warehouse Architecture, Architectural framework, Technical architecture, Architectural types.

Unit - 4
Infrastructure as The Foundation For Data Warehousing: Infrastructure supporting architecture, Hardware and Operating Systems, Database software, Collection of tools, Data Warehouse appliances.
The Significant Role of Metadata: Why Metadata is important, Metadata types by function areas, Business Metadata, Technical Metadata, How to provide Metadata.

Unit - 5
Principles of Dimensional Modeling: From requirements to Metadata, The Star schema, Star Schema keys, Advantages of the Star Schema, Star Schema: Examples
Data Mining Basics: What is Data Mining, Data Mining applications.

Recommended Books:
1. Paul Raj Poonia: *Data Warehousing Fundamentals for IT professionals, 2nd Edition*, John Wiley & Sons (2010).
2. Sam Anahony: *Data Warehousing in the Real World: A practical guide for building decisionsupport systems*, John Wiley(2004).
3. W. H. Inmon :*Building the data warehouse*, 4th Ed., John Wiley (2008).
4. Bob :*Data Warehousing*, BPB Publications (2004).

Sixth Semester
Course No.: BCA/6/EC/32
Name of Paper: Elective III (any one)
b) Computer Networking –II

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                  (4- 1- 0)

Unit – 1   **(10 L)**
Introduction: Attacks (Virus, Worms, Trojan Horses, Hoaxes, Dictionary attack, Brute Force, DOS, DDOS, Phishing, Spoofing, Man-in-the-middle, Mail bombing, Sniffers, Social Engineering), Services and Mechanism, Model for Internetwork Security.

Unit-2   **(10 L)**
Cryptography: Plain Text, Ciphertext, Key, Symmetric key cryptography (Traditional ciphers, DES, AES), Asymetric -Key Cryptography (RSA, Diffie-Hellman), Message Integrity, Message Authentication, Digital Signature, Key management.

Unit – 3   **(10 L)**
Network Security: Confidentiality, Integrity (Message Digest, SHA-1), Authentication (MAC, HMAC), Digital signature, Entity authentication.
Internet Security: Network Layer Security, Transport Layer Security, Application Layer Security.

Unit– 4   **(10 L)**
IP Security: AH, ESP, services, Security association, IKE, VPN.
SSL/TLS: SSL (Services, security parameters, sessions and connections, protocols, TLS.
PGP (Security parameters, services, Key rings, Certificates). Firewalls (Packet-filter and Proxy firewalls).

Unit– 5   **(10 L)**
Security technology: Intrusion detection and prevention system (IDPS), Port scanners, Firewall analysis tools, Operating system detection tools, Vulnerability scanners, Packet sniffers, Wireless security tools. Antivirus Software, Malicious virus remover, worm remover.

Recommended Books:

1. Behrouz A Forouzan: *Data Communication and Networking*, 4th Edition Tata McGraw Hill Publication (2003).
2. Andrew S. Tanenbaum: *Computer Networks*, 5th Edition, Prentice Hall Publication (2010).
3. Michael E. Whitman and Herbert J. Mattort: *Principles of Information Security*, 4th Edition, Cengage Learning (2011).
3. W. Stallings: *Networks Security Essentials: Application & Standards*, Pearson Education (2000).
4. W. Stallings: *Cryptography and Network Security, Principles and Practice*, Pearson Education (2000).

Sixth Semester
Course No.: BCA/6/EC/32
Name of Paper: Elective III (any one)
c) Mobile Computing

Marks Scale: **100** marks (End Sem. Exam: 75 + Int.: 25)   Credit: **5**
                                                                (4- 1- 0)

Unit 1
 Introduction
Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing
Applications – Characteristics of Mobile computing – Structure of Mobile Computing
Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random
Assignment Schemes – Reservation Based Schemes.

UNIT 2
Mobile Internet Protocol and Transport Layer
Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route
Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window –
Improvement in TCP Performance.

UNIT 3
Mobile Telecommunication System
Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) –
Universal Mobile Telecommunication System (UMTS).

UNIT 4
Mobile Ad-Hoc Networks
Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential
of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (
VANET) – MANET Vs VANET – Security.

UNIT 5
Mobile Platforms and Applications
Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile
Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone –
MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

Recommended Books:
1. Jochen Schiller: *Mobile Communications* Second Edition – Pearson Education
2. William C.Y.Lee: *Mobile Cellular Telecommunications* Second Edition-Mc-Graw-Hill
3. Sandeep Singhal: *The Wireless Application Protocol, Writing Applications for Mobile
Internet*, Pearson Education, 2000

Sixth Semester
Course No.: BCA/6/CC/33
Name of Paper: Major Project

Marks Scale: 300 marks (End Sem. Exam: 200 + Int.: 100)　　　　　　Credit: **14**
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Objective:

The Project work constitutes a major component in most professional program. It needs to be carried out with due care, and should be executed with seriousness by the students. The project work is not only a partial fulfillment of the BCA requirements, but also provide a mechanism to demonstrate your skills, abilities and specialization. The objectives of the project is to help the student develop the ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories. The purpose behind the inclusion of this is to consolidate the concepts and practices that were imparted during the course arid to serve as record of competence. It should enable the students to apply concretely in a small package the concepts pined from system analysis and design.

Students should take this project work **very seriously.** Topics selected should be complex and large enough to justify as a BCA project. Please do not undertake the topics/specifications from the Mini Project. The project should be genuine and original in nature and should not be copied from anywhere else.

Mark Distribution:

Marks distribution for internal as well as external is given below:

Topics	External
Project Record	25 Marks
Project Development and execution	100 Marks
Viva Voce	50 Marks
Presentation	25 Marks
Total	**200 Marks**

Internal　　– 100 marks

Steps Involved in The Project Work:

The complete project work should be done by the student only. The role of guide should be about guidance wherever any problem encounters during project.The following are the major steps involved in the project, which may help you to determine the milestones and regulate the scheduling of the project:
1)　　Select a topic and a suitable guide.
2)　　Prepare the project proposal in consultation with the project guide.
3)　　Submit the project proposal along with the necessary documents

4) Obtain receipt of the project approval from concerned department
5) Carry out the project-work.
6) Prepare the project report.
7) Submit the project report to the department concerned
8) Appear for the viva-voce or presentation as per the intimation.

Project Synopsys:

The student can formulate a project synopsis with the help of her/his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory**. If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project. Synopsis of the project proposal covering the following aspects must be submit to the department:

(i) Proposed Title of the Project.
(ii) Why is the particular topic chosen?
(iii) Introduction and Objectives of the Project.
(iv) Software Requirement specifications.
   ❖ Hardware Requirements
   ❖ Software Requirements
(v) A complete structure which includes:
   ➢ Number of modules and their description
   ➢ Data Structures as per the project requirements for all the modules
(vi) List of reports that are likely to be generated

The project synopsis must have proper cover page and signature of students and the guide to show his or her acceptance and willingness to guide.

Acceptance/Rejection of Report:

The student must submit a Synopsis of the project report to the Institute for approval. The Principal/Teacher in charge holds the right to accept the project or suggest modifications for resubmission. Only on acceptance of draft project report, the student should make the final copies.

Project File:

Model 1
1. The topic for the project can be any sub-system of a system software or tool or any scientific or a fairly complex algorithmic situation.
2. The aim of this type is to highlight the abilities of algorithmic formulation, program and data flow representation, modular programming, optimized code preparation and systematic documentation and other associated aspects of software engineering.

Model 2:
1. This model can be of a typical business oriented application. The aim of this type is to highlight the stages involved in a typical business oriented project development, though on a

miniature scale and simulated environment. The appropriate use of DBMS/RDBMS towards any business application, along with adequate level system analysis and structured design and development of specific tools/products would be the underlying activity, in a preparing this project.

2.   The emphasis should be on selecting a system/ sub- system which shows the DBMS and System Analysis aspects, to a greater degree. Any small and simple business may be selected, although candidate's arc advised to use their knowledge and creativity, to select typical and intelligent applications, rather than run-of-the- mill themes, such as simple Pay Roll calculation or Issue Return portion on an inventory scheme. The Evaluation stage would give due weightage for theme selection, problem analysis, fact finding techniques and initial design, which is as close to real life business situations as possible.

3.   The project may be earned out in any of the X base family products which are equivalent to Oracle/Access. The code can be generated out of four GL Interface, like Screen Builder and Report Generator, or can be totally hand- coded or a combination of both. The documentation need not contain the code generated by these applications, but only written by the candidate.

Format for Submission of The Project Report:

The student must adhere strictly to the following format for the submission of the Project Report.
Paper:
The Report shall be typed on White paper, A4 size or continuous computer stationery bond, for the final submission. The Report to be submitted to the MizoramUniversity must be original and subsequent copies may be photocopied on any paper.
Typing:
The typing shall be of standard letter size, double spaces and on one side of the paper only, using black ribbons and black carbons.
Margins:
The typing must be done in the following margins:
Left ..35mm, Right ..20mm,
Top ..35mm, Bottom ..20mm.
Binding:
The report shall be rexin bound in black. Plastic and spiral bound Project Reports not is accepted.
Front Cover:
The front cover should contain the following details:
TOP: The title in block capitals of 6mm to 15mm letters.
CENTER: Full name in block capitals of 6mm to 10mm letters.
BOTTOM: Name of the University, Year of submission-all in block capitals of 6mm to 10mm letters separate lines with proper spacing and spacing.
Blank Sheets:
At the beginning and end of the report, two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

Abstracts:
Every report should have an Abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters. The abstract should not exceed 800 words.

Contents:
The contents shall follow the abstract indicating the title of the chapters, section, subsection etc.

Format of The Project Report:
The format of the report should be prepared according to the format given below:

- Cover Page
- Institute Certificate
- Certificate from Company acknowledgements.
- Abstract
- List of Figures.
- List of Tables
- Nomenclature and Abbreviations.
- Contents
- **Introduction**
  - Introduction
  - Objectives
  - Scope and Purpose
- **System Analysis**
  - Need for system
  - Feasibility Study
  - Hardware Requirements
  - Software Requirements Specifications
  - Software Engineering Paradigm applied
  - System Flow Charts
  - Entity Relationship Diagram
  - Data Flow Diagram
- **System Design**
  - Program Structure
  - Modularization Details
  - User Interface Design
    - Menu Explanation
    - Design of Input Output screens and reports
  - Database Design
    - Schema Design & Normalization
    - Data Integrity and Constraints
    - Data Dictionary
- **Coding**
  - Complete Project Coding
  - Comments and Description of Coding segments
  - Standardization of the coding
  - Error Handling Mechanism
  - Parameters calling and passing
  - Validation checks
- **Testing**
  - Testing techniques and Testing strategies

- o Testing Case Design
- o Test reports
➢ Drawbacks and Limitations
➢ Conclusion
➢ Bibliography

Viva-Voce and Presentation:

The viva-voce will be conducted by an external examiner appointed by the University and an internal examiner from the College. Other members of the faculty and students may be present. It will be of a duration of about 15 to 20 minutes. The logic, analysis and design aspects relevant to the project mentioned under assessment would be the main subject matter for the viva. However, the general proficiency of the candidate in the selected software platform should also be tested.

Number of Copies:

The student should submit four (4) hard-bound copies of the Project Report and Soft copy on CD/DVD to the college or university which will be forward as given below:
 (1) One copy to their college
 (2) One copy to the university or Board
 (3) One copy for the project guide
 (4) One copy for student which they may collect after getting all necessary signatures.

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