

SYLLABUS
COMPUTER APPLICATION
PROGRAMME

Bachelor of Computer Application (BCA)

UNDER DISTANCE EDUCATION

~~(Approved by the 116th meeting of the Academic Council held on 30.04.2019)~~
(Semester Mode)



CENTRE FOR DISTANCE AND ONLINE EDUCATION
DIBRUGARH UNIVERSITY
DIBRUGARH-786004
ASSAM, INDIA

SYLLABUS

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The BCA Programme under Centre for Distance and Online Education shall comprise of 31(Thirty-One) courses of hundred marks each including Environmental studies where only grade is given.

There shall be 31 (Thirty-One) compulsory courses till the sixth semester.

The snapshot of courses comprising the six semesters of BCA Programme under Centre for Distance and Online Education are as follows:

COURSE STRUCTURE:

FIRST SEMESTER (All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-101	Computer Fundamentals	2	---	14 units	12	120	4
BCA-102	Mathematics – I	2	---	9 units	9	90	3
BCA-103	Business Communication and Grooming	2	---	14 units	12	120	4
BCA-104	Programming in C	2	---	14units	12	120	4
BCA-105	Digital Design	2	---	14 units	12	120	4
BCA-106	Laboratory	2	9	--	--	60	3

SECOND SEMESTER
(All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-201	Mathematics – II	2	---	6 units	6	60	2
BCA-202	Discrete Mathematics	2	---	9 units	9	90	3
BCA-203	Data Structure Using C & C ++	2	---	14 units	12	120	4
BCA-204	Accounting & Financial Management	2	---	9 units	9	90	3
BCA-205	Computer Architecture & Organization	2	---	14 units	12	120	4
BCA-206	Laboratory	2	6	----	---	60	2

THIRD SEMESTER
(All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-301	Mathematics - III	2	---	9 units	9	90	3
BCA-302	Theory of Computing	2	---	14 units	12	120	4
BCA-303	Internet and Web Programming Technology	2	---	14 units	12	120	4
BCA-304	Computer Graphics	2	---	14 units	12	120	4
BCA-305	Design and Analysis of Algorithms	2	---	14 units	12	120	4
BCA-306	Uses of Internet and its Application (Practical)	2	6	---	---	60	2

FOURTH SEMESTER
(All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-401	Numerical Analysis & Scientific Computing	2	---	14 units	9	90	3
BCA-402	Database Management System	2	---	14 units	12	120	4
BCA-403	Operating System	2	---	9 units	12	120	4
BCA-404	Object Oriented Programming using JAVA	2	---	9 units	9	90	3
*BCA-405	Environmental Studies	---	---	---	---	---	---
BCA-406	RDBM Using Oracle (Practical)	2	6	---	---	60	3

*Compulsory paper in any degree course. Only Grade is given.

FIFTH SEMESTER
(All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-501	Data Communication & Computer Network	2	---	14 units	12	120	4
BCA-502	Operation Research	2	---	10 units	9	90	3
BCA-503	Software Engineering	2	---	14 units	9	90	3
BCA-504	Project Work (Minor)		---	--	--	--	2

SIXTH SEMESTER
(All courses are compulsory)

Course code	Course Name	No. of Assignments	Practical Sessions	Size of SLMs Range	No. of Counselling Sessions Theory (10% of total study hours)	Study input (in terms of hours)	Credit Value of the course
BCA-601	Introduction to Artificial Intelligence	2	---	9 units	12	120	3
BCA-602	System Software	2	---	9 units	12	120	3
BCA-603	Project Work (Major)		---	---	---	---	4

1.0 Schedule of Programme:

An Under-Graduate programme under Distance Education shall be conducted in six Semester – (Semester I, Semester II, Semester III, Semester IV, Semester V and Semester VI). The schedule for the Distance Education System shall be as shown below:

- (i) Odd Semesters (i.e., First and Third): July to December
(including End Semester Examinations)
- (ii) Even Semesters (i.e., Second and Fourth): January to July
(including End Semester Examinations)

1.1 The total marks in BCA Programme in Open and Distance Learning shall be as follows:

- 1.1.1** BCA Programme of CDOE, D.U. is of 3-years duration and the total credit is 100.
- 1.1.2** Total marks for the three years BCA Programme of CDOE, D.U. shall be 3000 per programme.
- 1.1.3** 30% of the marks in each course shall be assessed through assignments.
- 1.1.4** Rest 70% of the marks in each course (paper) shall be assessed through University End Semester Examination. Each theory course shall carry objective type of questions i.e. multiple choice questions, of 30 marks and long answer type questions of 40 marks.

The syllabus for each course (paper) shall be divided into blocks and units keeping in view the Credit value of the course. The norms for delivery of courses through distance mode are as under:

Credit Value of the course	Study input (hours)	Size of SLMs (unit)	No. of Counselling Sessions Theory (10% of total Study hours)	* Practical Session (hours)
2 credits	60	6 – 8	6	60
3 credits	90	10-12	9	90
4 credits	120	14 – 16	12	120
6 credits	180	20 – 24	18	180

*Practicals are held at designated Institutions/ Study Centres for which schedule is provided by the Study Centre.

Attendance in practical is compulsory.

2.0 Assignment:

- 2.1.** Assignment shall be a compulsory component of the evaluation process.
- 2.2.** **30%** of each course (paper) shall be assessed through Assignments (Internal Assessment – In Semester Examination). Rest **70%** of the marks in each course (paper) shall be assessed through University End Semester Examination
- 2.3.** The assignments to be submitted by a student would depend upon the Credit value of the Course, as follows:

Credit value of the course	No. of Assignments
2 Credits	1
3 credits	2
4 credits	2
6 credits	2

- 2.4.** A candidate may submit assignments in the office of the Centre for Distance and Online Education or at the Study Centres within the stipulated time. Subsequently the study centres shall transmit all the assignments programme-wise and course-wise to the office of the CDOE for assessment.
- 2.5.** Marks secured on the assignments by the candidates, who appeared in the examinations but failed, shall be carried over to the next permissible chances.
- 2.6.** Marks secured on the assignments by the candidates who filled in the examination forms but did not appear in the examination, shall also be carried over the next permissible chances.
- 2.7.** A candidate who fails to submit the assignments as per clauses shall be awarded zero in the In-Semester Examination in the course where assignment(s) is (are) not submitted.

3.0 Examination and Evaluation

- 3.1** Setting of question papers, moderation of question papers, evaluation of answer scripts, scrutiny, tabulation of marks etc and announcement of results shall be governed by the Dibrugarh University Examination Ordinance 1972 (as amended upto date).
- 3.2** There shall be end Semester examination for each batch.
- 3.3** The Examination(s) for the BCA Programme shall be as follows –
 - 3.3.1** End Semester Examination in each theory course (paper) in BCA shall be of three hours duration and shall carry a maximum of 70 marks. Each theory course shall carry objective type of questions i.e. multiple choice questions, of 30 marks and long answer type of 40 marks.
 - 3.3.2** 30 marks will be assigned in each course for internal assessment. The internal assessment shall be evaluated through Sessional Test, written assignments and quizzes in counselling programmes.
 - 3.3.3** A candidate shall have to obtain a minimum of 40% marks in each theory and laboratory course (End Semester examination and internal assessment together) in order to pass the course.
 - 3.3.4** At the end of each examination the marks of various internal assessments and the Project Work shall be submitted to CDOE, D.U. by the Co-ordinator of the approved study centres.

3.4 Pass percentage for individual courses both in theory as well as project work shall be 40%.

3.5 The following shall be applicable to the candidates who fail in the examination.

3.5.1 Failure in the courses shall entitle the student to take the examination of the failed courses along with the next batch while pursuing next academic year.

3.5.2 Marks of assignments and project work will be carried over in case of failed learners.

3.5.3 Learners who have failed in one semester have to repeat examination along with the next batch while continuing in the next academic year.

3.5.4 The BCA programme must be completed within a maximum of 12 semesters or 6 years.

3.5.5 A candidate who fails to appear in an examination after obtaining eligibility for appearing in the same amounts to losing a chance.

3.6 The degrees shall be offered to each learner, who has passed the Sixth Semester BCA Programme in the following manner:

Letter Grade Meaning		Grade Point
O	Outstanding	10 (Marks securing 90%-100%)
A+	Excellent	9 (Marks securing 80%-90%)
A	Very Good	8 (Marks securing 70%-80%)
B+	Good	7 (Marks securing 60%-70%)
B	Above Average	6 (Marks securing 50%-60%)
C	Average	5 (Marks securing above 45%-50%)
P	Pass	4 (Marks securing 40%-45%)
F	Fail	0 (Marks securing less than 40%)
Abs	(Absent)	0

The Class interval of percentage of marks shown above is based on Exclusive Class Interval Technique. For example, the class interval 50-60 includes candidates scoring percentage of marks starting from 50 upto any percentage less than 60.

Programme Outcome (Overall Results)

CGPA	0-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.0	8.0-9.0	9.0-10.0
Letter Grade	F	P	C	B	B+	A	A+	O

Computation of SGPA and CGPA: The procedure to compute the SGPA and CGPA are given below:

- (i) The SGPA is the ratio of the sum of the products of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student.

$$SGPA (S_i) = \sum C_i G_i / \sum C_i$$

Where C_i is the number of credit of the i th course and G_i is the grade point scored by the student in the i th course.

- (ii) The CGPA is also calculated in the same manner taking in to account all courses undergone by a student over all the semesters of a programme.

$$\text{CGPA (S}_i\text{)} = \sum C_i S_i / \sum C_i$$

The SGPA and CGPA shall be rounded off to two decimal points and reported in the transcripts.

- (iii) **Conversion of CGPA in to percentage (%):** CGPA will be multiplied by 10. Percentage of marks = (CGPA × 10)
- (iv) The Letter grade 'B+' and above shall be considered as First Class and Letter grade 'B' shall be considered as Second Class.
- (v) A student is considered to have completed a course successfully and earned the prescribed credits if he/she secures a letter grade other than F (Fail) or 'Abs' (Absent/ Incomplete).
- (vi) If a candidate secures 'F' grade in a course, he/she shall have to reappear in the course in the next legitimate chance.
- (vii) If a student secures 'F' grade in Project Work/ Dissertation/ Assignment etc., he/she shall have to re-submit it after necessary revisions. The Result shall be declared with next regular batch.
- (viii) 'Abs' grade shall be awarded to a candidate if he/she has not fulfilled the following requirements:
- (a) If a candidate fails to appear in any Course(s) in an end semester examination.
 - (b) If a candidate fails to submit the project work/dissertation/ assignments of an End semester examination.
 - (c) If a candidate is certified as not eligible to appear in any course(s) in an end semester examination by the Course Teacher(s) due to insufficient attendance in lectures, tutorials, practicals or fieldworks.
- (ix) The candidates not appearing in a semester Examination shall be considered as an 'Abs' candidate and that will be reflected in the Grade Sheet of the candidate. These candidates shall have to convert the 'Abs' grade by appearing in the next examination on the Course (provided he/she has legitimate chance to appear the course) concerned or by submitting project work/ dissertation/ assignment etc.
- 3.6.1** Result of the learners appeared in the 'Betterment' examination shall not be counted for the award of Prizes / Medals / Rank or Distinction.

3.6.2 A learner shall have to pay a prescribed fee to appear in the '**Betterment Examination**' fixed by the University from time to time.

4.0. Academic Bank of Credit

The learners shall register themselves on (Academic Bank of Credit) ABC portal which is a mandatory requirement for admission, examinations and ID card purposes.

5.0. Transcript

The University may issue consolidated Transcript on payment of a prescribed fee which shall contain Letter grades, grade points and SGPA and CGPA mentioning the Course Titles in details, medium of instruction and programme duration.

6.0. Rules for admission of Unsuccessful and Absentee Candidates

Unsuccessful learners who fail to complete the programme within the stipulated time may take readmission in the programme by paying fees fixed by the University from time to time.

- 7.0.** For any matter not covered under these Regulations for the Centre for Distance and Online Education, the existing Dibrugarh University Rules, Ordinances and the Dibrugarh University Act, 1965 (as amended), The Dibrugarh University Examination Ordinance, 1972 (as amended up to date) and the Dibrugarh University Distance Education Ordinance, 2006 (amended up to date) shall be applicable.

DETAILED SYLLABUS

Course Title	:	Computer Fundamentals
Course Code	:	BCA-101
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Introduction to Computer Fundamental and Information Technology **Marks-20**

Brief history of development of computers, computer system concepts, capabilities and limitations, type of computers: Analog, Digital, Hybrid, General, special purpose, Micro, Mini, Mainframe, Super Computers; Complete Elaboration of Computer generation, Personal Computers, Types of Personal Computers - Laptop, Palmtop etc.

Block II: Computer Organisation and Working **Marks-20**

Computer System, Basic Components of Computer System, Input Devices, Output Devices, Storage Devices.

Block III: Computer Software **Marks-30**

Need & Types of Software; Need of software, Types of Software, System Software and application software, Programming Languages, machine, Assembly, High level 4 GL, their Merits and Demerits. Application Software - Word processing, spread sheet, Presentation Graphics, Database Management Software.

Computer Virus, Introduction to Computer Virus, Disadvantages of Computer Virus, Types of Computer Virus, Introduction to operating systems.

Recommended Books and Suggested Readings:

1. Sinha P.K., "Computer Fundamentals", 2012, Sixth Edition, BPB Publication
2. Rajaraman,V, "Computer Fundamentals", 2012, Sixth Edition, PHI
3. Goel.A., "Computer Fundamentals", 2011 Reprint, Pearson Education

Course Title	:	<u>Mathematics-I</u>
Course Code	:	BCA-102
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Mathematical Logic & Discrete Structures

Marks-30

Logic: Propositional Logic - Syntax, Semantics, Laws of deduction normal forms, Resolution, theorem proving, First Order logic - Universal & existential Quantifiers, syntax, terms of Predicate. Combinatorics & Discrete Structures: Permutations, Combinations, Counting & summation, sets, Cartesian Product relations, their types, Functions Partial Orders & Lattices.

Block II

Marks-40

Mathematical Statistics & Matrix Algebra

Collection of data, frequency distribution, measures of central tendency and dispersion, probability - concepts, Bayes' theorem, concepts on Discrete & continuous random variables & distributions - binomial, Poisson and normal distributions.

Complex Numbers & Matrix Algebra

Complex number as an ordered pair, operations on complex numbers, DeMoivre's Theorems, roots of complex numbers. Elementary concepts, Matrix operations, rank and inverse of a matrix, solution of algebraic equations - consistency conditions, Determinants and their properties.

Recommended Books and Suggested Readings:

1. Biggs N.L., "Discrete Mathematics", 2nd Edition, Oxford University Press, 2009.
2. Goldberg J. L., Potter M. C., Edward A. "Advanced Engineering Mathematics"; Third Edition, Oxford University Press, 2005.
3. Lipschutz S., Lipson M. L., Patil V. H., "Discrete Mathematics (Schaums Outlines)", 3rd Edition, Tata McGraw Hill, 2013.

Course Title	:	Business Communication and Grooming
Course Code	:	BCA-103
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Business communication and self-development

Marks-15

Introducing Business Communication, Basic Forms of Communication, Communication models and processes, Effective Communication, Theories of Communication, Audience analysis; Self-Development and Communication, Development of positive personal attitudes, SWOT analysis, Voté's model of interdependence, Whole Communication, Corporate Communication, Formal and Informal Communication Networks, Grapevine, Miscommunication (Barriers), Improving Communication.

Block II: Principles of Effective Communication

Marks-15

English Grammar: The Noun, The Pronoun, Articles, The Adjectives, the Verb; Practices in Business Communication, Group Discussions, Mock Interviews, Seminars, Effective Listening Exercises, Individual and Group Presentations and Reports Writing; Writing Skills, Planning Business Messages, Rewriting and Editing, The First Draft, Reconstructing the Final Draft, Business Letters and Memo Formats, Appearance Request Letters, Good News and Bad News letters, Persuasive Letters, Sales Letters, Collection Letters, Office Memorandum.

Block III: Report Writing and Presentation Skills

Marks-15

Report Writing, Introduction to a proposal, Short Report and Formal Report, Report Preparation; Oral Presentation, Principles of Oral Presentation, Factors Affecting Presentation, Sales Presentation, Training Presentation, Conducting Surveys, Speeches to Motivate, Effective Presentation Skills, Interview Skills - Appearing in Interviews, Conducting Interviews, Writing Resume and Letter of Application.

Block IV: Personality Development

Marks-15

Personality and its Characteristics, Theoretical Perspectives of Personality, Personality Traits, Personality Development, Stages of Child's Personality Development, Role of relationships in Personality Development, Challenges in Child's Personality Development, Biological and Physical Aspects of Personality Development, Biological and Physical Aspects of Personality, Impact of Physical Appearance, Personality & Interpersonal Skills, Leadership of Personality, Leadership Framework, Influence of leadership, Personal Skills, Inter Personal Skills.

Block V: Communication Skills & Other Factors of Personality

Marks-10

Communication Skill, Communication Barriers, Importance of Non-Verbal Communication, Enhancing your Communications, Better Public Speaking and Presentation Writing Skills. Discipline and the Management, Building of Self Discipline, Key Ingrained of Self Discipline, The Pareto Principle, Time Management Tools, Types of Self-Assessment, Self-Assessment Tools, Habits of highly effective people, Understanding Yourself, Secrets of Happiness, Balancing our life.

Recommended Books and Suggested Readings:

1. Bansal, R.K. and J.B. Harrison, "Spoken English for India", Orient Longman.
2. Thorat, Ashok et al., "Enriching Your Competence in English", Orient Longman
3. Singh, Vandana., "The Written Word", Oxford Publication

Course Title	:	Programming in C
Course Code	:	BCA-104
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block 1: Introduction to ‘C’ Language

Marks: 15

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition. Arithmetic operators and Expressions, Constants and Literals , Simple assignment statement, Basic input/output statement, Simple ‘C’ programs

Block 2: Conditional Statements and Loops

Marks: 20

Decision making within a program, conditions, Relational Operators, Logical Connectives ,if statement, if-else statement ,Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structures Programming.

Block 3: Arrays & Functions

Marks:20

One dimensional arrays: Array manipulation; Two dimensional arrays, Top-down approach of problem solving, Modular programming and functions, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments.

Block 4: Structures , Pointers & File Processing

Marks: 15

Structures

Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays.

Pointers & File Processing

Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays. Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file

Recommended Books and Suggested Readings:

Text Books:

1. Gottfried Byron “Programming with C” 3 rd edition, Tata McGrawhill, 2010
2. Balaguruswami, D “Programming with ANSI-C” 6 th Edition, Tata McGraw Hill, 2012.
3. Dromey, R.G. “How to solve it by Computer”, latest reprint, Prentice, 2011.

Course Title	:	Digital Design
Course Code	:	BCA-105
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Representation of Information

Marks-40

Number System, Arithmetical Operations, Binary, Octal and Hexadecimal, Positive and negative numbers, fixed and floating point, Addition, subtraction, Multiplication and division of numbers, ASCII Codes for error detection and correction, concept of Hamming Distance

Block II: Logic Design & Circuits

Marks-30

Boolean Algebra & Switching function, Minimization and realization using logic gates, Multiplexers, decoders, encoders, Flip flops, registers and Counters.

Recommended Books and Suggested Readings:

1. Mano.M.M, "Digital Logic and Computer Design", Pearson ,2004
2. Wakerly J.F., "Digital Design: Principles And Practices", Pearson, 4th Edition, 2008

Course Title	:	Laboratory
Course Code	:	BCA-106
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Lab Course

Marks-70

This lab course is completely based on C. The basic objective of the course is to provide the hands-on experience on C Programming and improve the practical skill set. Also, to apply all the concepts of C programming. The learner will try to apply the alternate ways to provide the solution to a given problem. The learner will be able to develop the logic for the given problem, recognize and understand the syntax and construction of C code, gains experience of C, know the steps involved in compiling, linking and debugging C code, feel more confident about writing the C functions, write some complex programs.

Recommended Books and Suggested Readings:

1. Gottfried Byron "Programming with C" 3 rd edition, Tata McGrawhill, 2010
2. Balaguruswami, D "Programming with ANSI-C" 6 th Edition, Tata McGraw Hill, 2012.
3. Dromey, R.G. "How to solve it by Computer", latest reprint, Prentice, 2011.

Course Title	:	Mathematics-II
Course Code	:	BCA-201
Nature of the Course	:	General
Total Credits	:	2 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Differential Calculus

Marks-40

Limitations, Theorems & Lagrange's Multiplier, Limits, Continuity and differentiability, Rolle's Theorem, MTVs, Taylor's and Maclaurin's Theorems with remainders, indeterminate forms, partial derivatives and differentials, Euler's Theorems or homogeneous functions, maxima and minima of single Multiple variables Language's Multiplier.

Block II: Integral & Differential Calculus

Marks-30

Integral Calculus, Indefinite integral, Elementary methods of integration, definite integrals reduction formulae, application of integral calculus - length, area, volume Idea of multiple integrals.

Recommended Books and Suggested Readings:

1. Kreyszig E. "Advanced Engineering Mathematics", Tenth Edition, Wiley, 2010.
2. Ayres F., Mendelson E. "*Schaum's Outline of Calculus*", 6th Edition, McGraw Hill Education, 2013.

Course Title	:	Discrete Mathematics
Course Code	:	BCA-202
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Algebraic Structures

Marks-30

Fundamental Concepts & Vectors, Groups, Rings, Fields, spaces – linear, Dependence of Vector, linear transformation, bilinear forms, eigen values and eigen vectors.

Block II: Graph Theory

Marks-40

Fundamental Concepts, algorithms & applications Basic terminologies of graph theory, Multigraphs and weighted graph, paths and circuits, planar graphs, trees and rooted trees, spanning trees and cut sets, colouring covering and partitioning directed graphs, enumeration of graphs, ideas on graphs theoretic algorithm and applications.

Recommended Books and Suggested Readings:

1. Biggs N.L., "Discrete Mathematics", 2nd Edition, Oxford University Press, 2009.
2. Lipschutz S., Lipson M. L., Patil V. H., "Discrete Mathematics (Schaums Outlines)", 3rd Edition, Tata McGraw Hill, 2013.

Course Title	:	Data Structure using C & C++
Course Code	:	BCA-203
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Basic Concepts

Marks- 20

Fundamental, Data Structures, Algorithms and types of applications, Basic Data Types, Stack, Queues, Lists & Recursion.

Block II: Trees & Sets

Marks-20

Trees- Definition and implementation binary tree, tree traversal, postfix, prefix notations, heap, Definition and implementation of hash table, priority queues.

Block III: Algorithms & File Structure

Marks-30

Sorting Algorithms- Quick sort, insertion sort, Bubble sort, merge sort; Searching Algorithms- Linear search, Binary search, depth first search and Breadth first search techniques; File Structure- Sequential, Index Sequential Files Structure.

Recommended Books and Suggested Readings:

- 1.Tenenbaum A. M.,”*Data Structures Using C*”,Pearson,2nd Edition,2009.
2. Baluja, G. S.”*Data Structure through C++*”, Dhanpat Rai Publication,2012.
- 3.Lipschutz, Seymour”*Data Structures*”, T. M. Hill,2010.

Course Title	:	Accounting and Financial Management
Course Code	:	BCA-204
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Fundamental of Accounting & Final Accounting

Marks-20

Accounting- Principles, concepts and convention, double entry system of accounting, introduction of basic books of accounts of sole proprietary concern, control accounts for debtors and creditors, closing of books of accounts and preparation of trial balance; Final Accounts- Trading, Profit and loss accounts and balance sheet of proprietary concern with normal closing entries, introduction to manufacturing account, final account of partnership firms, limited company.

Block II: Financial Management & Ratio Analysis

Marks-10

Financial Management- Definitions, Role and their applications; Ratio Analysis- Meaning, Advantages, Limitations, types of ratios and their usefulness.

Block III: Fund Flow statement & Costing**Marks-20**

Fund Flow Statement: Meaning of the terms - fund, flow of fund, working capital cycle, preparation and interpretation of the fund flow statement; Costing- Nature, importance and basic principles, budget and budgetary control, nature and scope, importance, method of finalization of master budget and functional budgets.

Block IV: Marginal & Standard Costing and Introduction to Computerized Accounting System**Marks-20**

Marginal Costing- Nature, Scope and importance, break-even analysis, its uses and limitation, construction of breakeven chart, practical application of marginal costing; Standard Costing- Nature and scope, computation and analysis of variances with reference to material cost, labour, labour cost and overhead cost, interpretation of the variances; Introduction to computerized Accounting System- Coding logic and codes required, master files, transaction files, introduction to document used for data collection, processing of different files and outputs obtained.

Recommended Books and Suggested Readings:

1. B.B. Dam; R.A. Sarda; R. Barman; B. Kalita: *"Theory and Practice of Accountancy (V-I)"*, Capital Publishing Company, Guwahati.
2. C.M. Juneja; R.C. Chowla; K.K. Saxena; *"Book-Keeping and Accountancy (V-I)"*, Kalyani Publishers, Ludhiana..
3. M.Y. Khan; P.K. Jain: *"Principles of Financial Management"*. Tata McGraw Hills, New Delhi

Course Title	:	Computer Architecture and Organisation
Course Code	:	BCA-205
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: The Von Neumann Architecture & ALU Organisation**Marks-20**

The Von Neumann Architecture, Details of Von Neumann Architecture, Simple ALU Organisation, Arithmetic Processor.

Block II: Control Unit & Memory Organization**Marks-25**

Control Unit, Hardwired and Microprogrammed Control, Memory Organisation, Primary Memory, Secondary Memory, High Speed Memory, Virtual Memory.

Block III: I/O Transfer, Peripherals & Assembly Language Programming**Marks-25**

I/O Transfer, Program Controlled, interrupt Controlled and DMA, Peripherals & Assembly Language Introduction to Computer buses, Peripherals, performance bench marking and current trends in architecture/ Assembly language programming.

Recommended Books and Suggested Readings:

1. Mano M.M, *"Computer System Architecture"*, Pearson, 3rd Edition, 2007 .
2. Hamacher.V.C., Vranestec, Z.G. and Zaky, S.G. *"Computer Organization"*, McGraw-Hill, 5th Edition, 2011.

Course Title	:	Laboratory
Course Code	:	BCA-206
Nature of the Course	:	General
Total Credits	:	2 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Recommended Books and Suggested Readings:

1. Tenenbaum A. M., "Data Structures Using C", Pearson, 2nd Edition, 2009.
2. Baluja, G. S. "Data Structure through C++", Dhanpat Rai Publication, 2012.
3. Lipschutz, Seymour "Data Structures", T. M. Hill, 2010.

Course Title	:	Mathematics-III
Course Code	:	BCA-301
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Complex Variables

Marks-30

Limit & Continuity, differential Equation, Limit, Continuity, differentiability and analyticity of functions, Cauchy- Riemann equations, Laplace Equations, Cauchy Integral formulae.

Block II: Advanced Topics & Transform Calculus

Marks-40

Advanced Topics- Infinite Sequences and series of real and complex numbers - their convergences, improper integrals, Power Series, radius of convergence, power series methods for solution of ordinary differential equations, Legendre equations and Legendre polynomials, Bessel equations and Bessel functions of first and second kind; Transform Calculus- Laplace transforms, inverse transform, shifting on the s & t axes.

Recommended Books and Suggested Readings:

1. Problems and exercises in integral equations by George Yankovsky, MIR Publishers.
2. Differential Equations by George F. Simmons, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Course Title	:	Theory of Computing
Course Code	:	BCA-302
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Regular Expression & Non-Deterministic Finite Automata

Marks- 30

Regular Expression- Introduction, Kleene closure, formal definition, algebra of regular expression, regular languages; Finite Automata- Finite Automata, Finite automata as output devices; Non-Deterministic Finite Automata- Introduction to NFA, equivalence of NFA and DFA, Pumping lemma, closure properties.

Block II: Context free Grammar & Turing Machine

Marks-40

Context Free Grammar- Grammar and its classification, push down automata (PDA), Non-Context Free Languages (CFL), pumping lemma for CFL, Equivalence of CFG and PDA; Turing Machine- Formal definition, Transition, Diagram, construction of Turing machine, language accepted and decided by Turing machine Chomsky hierarchy.

Recommended Books and Suggested Readings:

1. Linz P ,”*An Introduction to Formal Language and Automata*”, Jones and Bartlett Publishers, Inc. , USA, 2011.
2. Misha, K. L. P. “*Theory of Computer Science: Automata, Languages and Computation*” PHI, 3rd Edition, 2009

Course Title	:	Internet and Web Programming Technologies
Course Code	:	BCA-303
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Internet Technology and Protocol

Marks- 40

Introduction to Internet, Internet, growth of Internet, structure of Internet, Internet History of world wide web, Basic Internet Terminology; Internet Technology and Protocol- Internet Protocol: TCP/ IP, SLIP, PPP, Network and network devices, Addressing in Internet - DNS, domain name and their Organisation, Understanding the Internet Protocol address, Client - Server concept - architecture and application.

Block II: World Wide Web Browsers

Marks-30

World Wide Web, Evolution of WWW, Basic features, server's http, URL, search Engine, Searching categories, Hypertext; Browsers- Basic features, Book marks, customization of browsers, Netscape communicator and internet explorer; Interactivity Tools- HTML, ASP, VB-Script, Java Script.

Recommended Books and Suggested Readings:

- 1.Hahn, H, "*The Internet Complete Reference*", Mcgraw-Hill Osborne Media,2nd Edition,2002
2. Roy U.K ,"*Web Technologies*", Oxford University Press,1st edition, 2010.

Course Title	:	Computer Graphics
Course Code	:	BCA-304
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Graphics System & Output Primitives**Marks-30**

Graphics System- Introduction, Overview of Graphics System, Video display devices, input devices, hard copy devices, graphics software; Output Primitives- Points and lines, line drawing algorithms, circle and ellipse generating algorithms filled area primitives, attributes of output primitives.

Block II: Geometrical Transformation & Computer Animation**Marks-40**

Geometrical Transformations- Basic transformations, translations, rotation and scaling viewing and viewing functions; Clipping operations & Animation, point clipping line clipping etc., Text clipping, Introduction to computer animation and Virtual reality.

Recommended Books and Suggested Readings:

1. Hearn D and Baker M.P. ,"*Computer Graphics*" , PHI 2/e, 2011
2. Godse, A. P. "*Computer Graphics And Multimedia (English)*", Technical Publication ,1st Edition ,2011

Course Title	:	Design and Analysis of Algorithms
Course Code	:	BCA-305
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Fundamental algorithmic analysis & Strategies**Marks-40**

Basic Algorithmic analysis- Asymptotic analysis of upper and average complexity bounds, best, average and worst case behaviours, big-O, little -O, g and f notation, standard complexity closes, empirical measurements of performance, time and space tradeoffs in algorithms, using recurrence relations to analysis recure sine algorithms; Fundamental Algorithmic Strategies- Brute-force, greedy divide and conquer, backtracking, branch and bound, heuristics, pattern matching and string text algorithms, numerical approximation.

Block II: Fundamental Data Structure Strategies &Algorithms**Marks-30**

Fundamental Data Structure- Implementation strategies for graphs and trees, Performance, issues of Data Structures; Algorithms- Classes, P,NP, Polynomials reducibility, NP-Completeness.

Recommended Books and Suggested Readings:

1. Fundamentals of Computer Algorithms by Horowitz Sahni, University Press.
2. Introduction to the Design and Analysis of Algorithms by Anany Levitin , Pearson Education.

Course Title	: Uses of Internet and its Application (Practical)
Course Code	: BCA-306
Nature of the Course	: General
Total Credits	: 2 credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Recommended Books and Suggested Readings:

1. Robin N, "*Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5*", O'Reilly, 2014, 4th Edition.
2. Phillip H, "*JSP 2.0: The Complete Reference*", McGraw Hill, 2nd Edition, 2003.

Course Title	: Numerical Analysis and Scientific Computing
Course Code	: BCA-401
Nature of the Course	: General
Total Credits	: 3 credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Block I: Overview & Roots of equation**Marks-30**

Overview- FORTRAN Language Preliminaries, Floating - Point representation of numbers with finite Precision and its consequences, Concept of truncation and rounding - off errors, stability, consistency and convergence; Root of Equations: Iterative Methods - bisection, false - position, Newton - Raphson, solution of Polynomial equations, solution of simultaneous linear equations - Gaussian Elimination, Pivoting.

Block II: Curve Fitting, Differentiation & Integration**Marks-40**

Curve Fitting & Interpolation- Methods of least Squares, finite differences, Newton's Interpolation Formulae, Languages' Formula for unequal intervals, Newton's divided difference for unequal intervals, Newton's divided difference formula; Differentiation and Integration- Differentiation by Polynomial fit, Integration by Newton's Quadrature formula, trapezoidal rule, Simpson's rules, Solution by Taylor's Series, Euler's Method, Picard's Method Runge - Kutta Method.

Recommended Books and Suggested Readings:

1. Haribhaskaran G., "*Numerical Methods*", 2nd edition, Laxmi Publications, 2011.
2. T. Sauer., "*Numerical Analysis*", 2nd Edition, Pearson New International Edition, 2013.

Course Title	:	Database Management System
Course Code	:	BCA-402
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Databases, Data modeling & Storage

Marks-20

Databases & Database Users, Database system concepts and architecture data Models, Schemas and instances architecture database languages and interfaces, classification of DBMS; Data Modeling

Using E-R model, A complete approach to E-R model Concept; Record Storage & Primary File Organisation- Introduction, Secondary storage devices, buffering of blocks, operations of files, Files of unordered record (heap files, Files of ordered records (sorted files), hashing techniques, Index structures for files, Single level Ordered Indexes, Multilevel indexes, Dynamic multilevel indexes using B trees and B+ trees.

Block II: Data Models & Concepts

Marks-25

Relational Data Models, Relational model concepts, relational model constraints, update operations on relations, defining relations, Relational Algebra, Relational Database languages: SQL; Conventional Data Models, Network data model, Hierarchical Data Model.

Block III: Database Design & Transaction Concept

Marks-25

Database Design- Functional Dependencies and Normalization for Relational Database; Transaction Processing Concept- Introduction, transaction and system concept, Properties, schedules and recoverability, serial ability of schedules, concurrency Control, Error recovery and security.

Recommended Books and Suggested Readings:

- 1.Elmasri R, Navathe S.B., “*Fundamentals of Database Systems*”, Benjamin Cummings Publishing Company, 7th edition, 2015.
2. Silberschats, Korth and Sudershan, “*Principles of Database Systems*”, McGraw Hill Publication, 2011.

Course Title	:	Operating System
Course Code	:	BCA-403
Nature of the Course	:	General
Total Credits	:	4 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Process & Memory Management

Marks-30

Process Management- Process, thread, Scheduling Concurrency, Mutual Exclusion, synchronization, Semaphores, Deadlocks; Memory Management- Allocation, Protection, Hardware Support, Paging segmentation.

Block II: Virtual Memory & File System

Marks-40

Virtual Memory- Demand Paging, Allocation, replacement, Swapping, Segmentation, TBLs; File System- Allocation, Free Space Management, Directory Management, Mounting, I/O Management, Device Drivers, Disk Scheduling, Block I/O, Character I/O, Use of Unix/ Linux as a running example, Examples from Dos, NT.

Recommended Books and Suggested Readings:

1. Tanenbaum A.S., “*Modern Operating Systems*”, 2/e, Prentice Hall of India, New Delhi, 2002.
2. Chandra P., Bhatt P., “*An Introduction to Operating Systems Concept*”, Prentice Hall of India, 2006.

Course Title	:	Object Oriented Programming using JAVA
Course Code	:	BCA-404
Nature of the Course	:	General
Total Credits	:	3 credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Introduction to Java

Marks-30

Java overview, Difference between JDK, JRE and JVM, Internal Details of JVM, Variable and Data Type, Naming Convention, Garbage collection mechanism, Advantage of OOP, Encapsulation, Object and Class, Method Overloading, Constructor static variable, method and block, this keyword Inheritance, Packages and Interfaces, Inheritance, Method Overriding, super keyword, final keyword, Runtime Polymorphism, Abstract class, Wrapper classes, Java Array, String, String Buffer, String Builder, Interface, Package and Access modifiers.

Block II: Exception Handling

Marks-20

Types of Exception, try and catch block, Multiple catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception.

Block III: Multithreading

Marks-20

Multithreading, Life Cycle of a Thread, Creating Thread, Thread Scheduler, sleeping a thread, joining a thread, Thread Priority, Thread synchronization, wait, notify, notify All.

Recommended Books and Suggested Readings:

1. Herbert, S, "The Complete Reference to Java", 9th edition, Tata McGraw Hill, 2014
2. Malhotra, S. and Choudhary, S, 'Programming in Java', Second Edition, Oxford University Press, 2015.

Course Title	:	Environment Studies
Course Code	:	BCA-405
Nature of the Course	:	General
Total Credits	:	
Distribution of Marks	:	100 (End semester)

Block I: Study of Nature, Resources and Eco-System

The Multidisciplinary Nature of Environment Studies- Introduction, Objective, Environment, Multidisciplinary Nature of Environment Studies, Scope, Importance of Environment, Need for Awareness.

Natural Resources: Introduction, Objective, Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Resources.

Eco-System- Introduction, Objective, Concept of an Ecosystem, Structure and function of an Ecosystem, Producers, Consumers and Decomposers, Energy flow in the Ecosystem, Ecological Succession, Food Chains, Food webs and Ecological Pyramids, Introduction, Types, Characteristic Feature, Structure and Function.

Block II: Bio-Diversity and Pollution Control

Bio-Diversity & its Conservation- Introduction, Objective, Biographically Classification of India, Value of Biodiversity, Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values, Biodiversity at Global, National and Local Levels, India go a Mega-Diversity Nation, Hot-Spots of Biodiversity, Threats to Biodiversity: Habitat loss, poaching of Wildlife, Man-Wildlife Conflicts, Endangered and Endemic Species of India, Conservation of Biodiversity : In-Situ and ex-situ and ex-situ conservation of biodiversity.

Environment Pollution- Introduction, Objective, Causes, Effects and control, Solid waste Management: Causes, Effects and control Measures of Urban and Industrial Wastes, Role of an individual in Prevention of Pollution, Pollution Management: Floods, Earthquakes, Cyclone and Land-Slides.

Social Issues and the Environment- Introduction, Objective, Unsustainable to Sustainable Development, Water Conservation, Rain water harvesting, Watershed Management, Resettlement and Rehabilitation of People its Problems and concerns, Case Studies, Environmental Ethics; Issues and Possible Solution, Climate Change, Global Warming Acid Rain, Ozone layer Depletion, Nuclear Accidents and Holocaust, Case studies, Wasteland Reclamation, Consumerism and Waste Products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues Involved in enforcement of Environment Legislation, Public Awareness.

Block III: Study of Population Growth and Case studies

Human Population and Environment, Introduction, Objective, Population growth, Variation among Nations, Population Explosion - Family Welfare Programme, Environment and Human Health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies; Field Work- Introduction, Objective, Visit to a Local Area to Document Environmental Assets - River, Forest, Grassland, hill, Mountain, Visit to a local Polluted Site - Urban/Rural/Industrial /Agricultural, Study of Common Plants, Insects and Birds, Study of simple Ecosystem -Pond, river, Hill, Slopes etc. (Field Work Equal to 5 Lecture Hours).

Course Title	: RDMS using Oracle and Java Programming(Practical)
Course Code	: BCA-406
Nature of the Course	: General
Total Credits	: 2 credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Recommended Books and Suggested Readings:

1. Herbert, S, "The Complete Reference to Java", 9th edition, Tata McGraw Hill, 2014
2. Silberschats, Korth and Sudershan, "Principles of Database Systems", McGraw Hill Publication, 2011.

Course Title	: Data Communication and Computer Networks
Course Code	: BCA-501
Nature of the Course	: General
Total Credits	: 4 credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Block I: Computer Network, Communication & Transmission Errors**Marks-40**

Computer Network- Introduction to Computer Networks, Types of Networks, Network Topologies, Network reference Models, OSI reference Model, TCP/IP reference Model; Communication- Introduction, Mathematical basis of Data Communication, Analog and digital Transmission, Parallel and Serial Communication, Asynchronous and synchronous Communication, Multiplexing & Demultiplexing; Transmission Errors- Detection & Correction of transmission errors, Data compression & Encryption.

Block II: Description of Layers, Protocols & Applications**Marks-30**

Description of Layers, Physical Layer, Data link layer, Network layer Transport layer, Session layer, Presentation Layer, Application Layer.

Recommended Books and Suggested Readings:

1. Tenenbaum A.S., "Computer Networks", Pearson Education Asia, 4th Ed., 2011.
2. Behrouz A. F, "Data Communication and Networking", Tata Mc Graw Hill, 6th edition, 2014

Course Title	: Operation Research
Course Code	: BCA-502
Nature of the Course	: General
Total Credits	: 3 Credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Block I

Model Formulation

Marks-20

Introduction, Structure and assumption of a Linear Programming Problem (LP), General mathematical model of linear programming problem.

Graphical Solution Method

Introduction, Definitions, graphical solution method of an LP problem, multiple optimal solution, unbounded solution, infeasible solution.

Block II

Simplex Method

Marks-25

Introduction, standard form of LP problem, simplex algorithm (maximization case), Simple Algorithm (Minimization case), multiple optimal solution, Unbounded Solution.

Duality

Introduction, Formulation of dual linear problem, standard results on duality, advantage of duality.

Block III

Transportation problem

Marks-25

Introduction, Loops in transportation table and their properties, the transportation method, Linear programming formulation of the transportation problem, north west corner method for finding initial solution, leastcost method for finding initial solution. Vogel's approximation method for finding initial solution.

Test of Optimality

Dual of transportation model, economic interpolation of U S and V S, step of MODI method.

Recommended Books and Suggested Readings:

1. Sharma K. J., "*Operation Research – Theory and Application*", 3rd Edition, MacMillan India Ltd.2014.
2. Havinal V. "*Introduction to Operations Research*", 1st Edition, New Age International Publishers.2012

Course Title	: Software Engineering
Course Code	: BCA-503
Nature of the Course	: General
Total Credits	: 4 Credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Block I: Introduction to Software Engineering & Project Management

Marks-30

Introduction to Software Engineering- Concept of a Software project, size factor, Quality and Productivity factor different phases of Software development life Cycle; Software Project Management- Planning, Scheduling, Monitoring, Controlling etc., Requirement Specifications Software design function Oriented, object-oriented approaches, users' interfaces Software Programming, Structured Coding Techniques, coding Styles, Standard.

Block II: Software Verification, Validation & Reliability

Marks-40

Software Verification & validation- Theoretical Foundation, Block box and white Box approaches, Integration & system Testing; Software Reliability- Definition and Concept of reliability, software faults, Errors, Repair and availability, CASE Studies; Test of Optimality-Dual of transportation Model, Economic interpolation of US & VS, step of MODI Method; Protocols- Complete Description of Protocols used at each Layer of OSI reference Model; Applications- Description of applications at Each layers like Transmission Media, guided & Unguided Medial, repeaters, Hubs, Bridges, Switch IP addresses, Sub-netting, FTP, Telnet HTTP & Internet.

Recommended Books and Suggested Readings:

- 1 . Rajiv M., "Fundamentals Of Software Engineering", PHI Learning, 4th Edition, 2014.
2. Introduction to Software Engineering - www.newagepublishers.com/ n Software Engineering By K.K. Aggarwal
2. Ian Sommerville. Software Engineering (Seventh Edition). Addison-Wesley, 2004.

Course Title	: Project Work (Minor)
Course Code	: BCA-504
Nature of the Course	: General
Total Credits	: 2 Credits
Distribution of Marks	: 70 (End semester) + 30 (In semester)

Project Work (Minor)

Marks-100

The main objective of this project course is to provide learners a platform to demonstrate their practical and theoretical skills gained during the last semesters of study in BCA Programme.

Students are encouraged to spend some time of the fifth semester working on a project preferably in a software industry or any research organization. Topics selected should be not be much complex. The courses studied by the students during the BCA Programme provide them the comprehensive background knowledge on diverse subject areas in computer science such as computer programming, data structure, DBMS, Computer Organization, SAD, Software Engineering, Computer Networks etc., which will be helping students in doing project work.

Course Title	:	Introduction to Artificial Intelligence
Course Code	:	BCA-601
Nature of the Course	:	General
Total Credits	:	3 Credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: Overview of A.I

Marks-10

Introduction to AI, Importance of AI, AI and its related field (Machine Learning), AI techniques, Criteria for success.

Block II: Problems, problem space and search

Marks-15

Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.

Block III: Heuristic search techniques

Marks-15

Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction.

Block IV: Predicate Logic

Marks-15

Representing Simple Facts in logic, representing instances and is a relationship, Computable function and predicate.

Block V: Knowledge Representation

Marks-15

Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation.

Recommended Books and Suggested Readings:

1. David W. Rolston, "Principles of Artificial Intelligence and Expert System Development", McGraw Hill, 2012.
2. Elaine Rich, Kevin Knight: "Artificial Intelligence", Tata McGraw Hill, 2013.
3. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 2012.
4. Nils J Nilsson, "Artificial Intelligence -A new Synthesis" ,2nd Edition, Harcourt Asia Ltd. ,2011.

Course Title	:	System Software
Course Code	:	BCA-602
Nature of the Course	:	General
Total Credits	:	3 Credits
Distribution of Marks	:	70 (End semester) + 30 (In semester)

Block I: System Software & Assembler

Marks-30

Overview- Definition & classification of System software; Assembler- Assemble language, assemble process, Assembler Data structures, assemble Macros and Microprocessors.

Block II: Linker & Loaders

Marks-20

Basic Concepts, Static & Dynamic linking shared, Loaders, Overlays.

Block III: Compilers

Marks-20

Introduction & phases of a compiler; Lexical Analysis: Parsing & Intermediate code generation.

Recommended Books and Suggested Readings:

- 1) D. M. Dhamdhere, 1999, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw-Hill, New Delhi.
- 2) L. L. Beck, 1996, System Software An Introduction to System Programming, 3rd edition, Addison-Wesley.

Course Title	:	Project Work (Major)
Course Code	:	BCA-603
Nature of the Course	:	General
Total Credits	:	4 Credits
Distribution of Marks	:	60 (End semester)

Project Work (Major)**Marks-100**

The objective of the BCA project work is to develop a quality software solution by following the software engineering principles and practices. During the development of the project the students should involve in all the stages of the software development life cycle (SDLC). The main objective of this project course is to provide learners a platform to demonstrate their practical and theoretical skills gained during five semesters of study in BCA Programme. During project development students are expected to define a project problem, do requirements analysis, systems design, software development, apply testing strategies and do documentation with an overall emphasis on the development of a robust, efficient and reliable software systems.

Students are encouraged to spend maximum time of the sixth semester working on a project preferably in a software industry or any research organization. Topics selected should be complex and large enough to justify as a BCA final semester project. The courses studied by the students during the BCA Programme provide them the comprehensive background knowledge on diverse subject areas in computer science such as computer programming, data structure, DBMS, Computer Organization, SAD, Software Engineering, Computer Networks etc., which will be helping students in doing project work.
