BCA (Bachelor of Computer Applications)

PROGRAMME SPECIFIC OBJECTIVE:

The objective of the BCA programme is to prepare students for a career in software design, development and testing as well as IT support by training them in the core and emerging areas of computer applications.

BCA (Bachelor of Computer Applications)
Course Structure
(effective from June 2021)

BCA Course Structure for Semester–III

SEMESTER–III					
Paper code & Title	**T/P**	**Credits**	**External marks**	**Internal marks**	**Total marks**
CORE COURSES					
US03CBCA51 : Object Oriented Programming–I	**T**	**4**	**70**	**30**	**100**
US03CBCA52 : Data Structures–I	**T**	**4**	**70**	**30**	**100**
US03CBCA53 : Database Management System–II	**T**	**4**	**70**	**30**	**100**
US03CBCA54 : System Analysis and Design	**T**	**4**	**70**	**30**	**100**
US03CBCA55 : Practicals–I	**P**	**4**	**100**	**-**	**100**
US03CBCA56 : Practicals–II	**P**	**4**	**100**	**-**	**100**
ABILITY ENHANCEMENT COURSES					
US03ABCA57 : Computer Oriented Numerical and Statistical Methods	**P**	**2**	**50**	**-**	**50**
SKILL ENHANCEMENT COURSES (ANY ONE)					
US03SBCA58 : Digital Computer Electronics **US03SBCA59 :** Management Information System **US03SBCA60 :** E-Commerce **US03SBCA61 :** Accounting **US03SBCA62 :** Enterprise Resource Planning **US03SBCA63 :** Business Statistics	**T**	**2**	**50**	**-**	**50**
TOTAL CREDITS		**28**	**580**	**120**	**700**

BCA (Bachelor of Computer Applications)
Course Structure
(effective from June 2021)

BCA Course Structure for Semester–IV

SEMESTER–IV					
Paper code & Title	**T/P**	**Credits**	**External marks**	**Internal marks**	**Total marks**
CORE COURSES					
US04CBCA51 : Object Oriented Programming–II	**T**	**4**	**70**	**30**	**100**
US04CBCA52 : Data Structures–II	**T**	**4**	**70**	**30**	**100**
US04CBCA53 : Visual Programming	**T**	**4**	**70**	**30**	**100**
US04CBCA54 : Operating Systems	**T**	**4**	**70**	**30**	**100**
US04CBCA55 : Practicals–I	**P**	**4**	**100**	**-**	**100**
US04CBCA56 : Practicals–II	**P**	**4**	**100**	**-**	**100**
ABILITY ENHANCEMENT COURSES					
US04ABCA57 : Fundamentals of Operations Research	**P**	**2**	**50**	**-**	**50**
SKILL ENHANCEMENT COURSES (ANY ONE)					
US04SBCA58 : Multimedia Technology **US04SBCA59 :** Business Information System **US04SBCA60 :** System Software **US04SBCA61 :** Artificial Intelligence **US04SBCA62 :** System Security **US04SBCA63 :** Software Project Management	**T**	**2**	**50**	**-**	**50**
TOTAL CREDITS		**28**	**580**	**120**	**700**

BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03CBCA51**	Title of the Course	**Object Oriented Programming – I**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	To study the fundamentals of 1. Object Oriented Programming concepts using C++. 2. input/output, arrays and working with classes. 3. functions, function overloading and inheritance. 4. operator overloading, pointers and files.

Course Content		
Unit	Description	Weightage* (%)
1.	**Object Oriented Programming (OOP) Concepts and Introduction to C++** – Structured programming vs. object oriented programming – Basic OOP concepts : objects, classes, encapsulation, data hiding, inheritance, polymorphism – Introduction to C++: structure of a C++ program, data types, variables, constants, expressions, statements and operators – Usage of header files – Control flow statements: if else, for loop, while loop, do while loop, switch, break and continue	25
2.	**Input/Output, Arrays, Strings and Classes** – Basic I/O in C++ – Arrays in C++ : introduction, declaration, initialization of one , two and multi-dimensional arrays, operations on arrays – Working with strings : introduction, declaration, string manipulation and arrays of strings – Classes and objects in C++ – Constructors : default, parameterized, copy, constructor overloading and destructors – Access specifiers, implementing and accessing class members – Working with objects : constant objects, nameless objects, live objects, arrays of objects	25

3.	**Functions, Function Overloading and Inheritance** – Introduction to functions, library and user-defined functions, parameters passing, default arguments – Functions overloading, inline functions, friend functions – Inheritance: Introduction, derived class declaration, types of inheritance and member access ability, constructor and destructor in derived class, construction invocation and data member initialization. – virtual functions	25
4.	**Operator Overloading, Pointers and Files** – Operator overloading : Introduction, overloaded operators, unary operator overloading, operator keyword, operator return values, binary operators overloading, overloading with friend function – Usages of Pointers in C++ : basic overview Dynamic memory allocation – Files : introduction and applications – File operations : open, read, write, seek and close	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	Object Oriented Programming concepts using C++.
2.	Input/output, arrays and working with classes.
3.	Functions, function overloading and inheritance.

4.	Operator overloading, pointers and files.

Suggested References:	
Sr. No.	References
1.	E Balagurusamy : Object Oriented Programming in C++, Tata McGraw-Hill Publishing Co. Ltd.
2.	Robert Lafore : Object Oriented Programming in Turbo C++, Guide, Galgotia Pub. (P).
3.	Barkakati N. : Object Oriented Programming in C++, PHI.
4.	OOP's using C++ for Dummies.
5.	John R. Hubbard : Programming with C++ (Schaum's Outlines), McGraw Hill, Second Edition, 2000.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03CBCA52**	Title of the Course	**Data Structures- I**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	To study the 1. Fundamentals of data structures 2. Basic concepts related to stacks, queues. 3. Fundamentals of graphs, multilists and file organization.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to Data Structures** – Introduction to data structures - Definition, Types of Data Structures, applications and advantages – Primitive and non-primitive data structures and operations on them – Introduction to arrays, one and two-dimensional arrays – Representation of arrays in memory : row-major and column-major order – Address calculation of elements of one and two-dimensional arrays – Applications of arrays	25
2.	**Stack** – Introduction – Operations on the Stack- Push, Pop, Peep, Change – Applications of Stack – Infix, Postfix, Prefix Notations – Conversion: Infix to Postfix – Recursion : Definition and examples	25
3.	**Queues** – Types of queues : Simple queues, Circular queues, Double ended queues, Priority Queue – Applications of Queues – Operations on Simple and Circular Queues : Insert and Delete	25
4.	**Graph, MultiList and File Organization-I**	25

	– Graph - Basic Terminologies like Graph, Diagraph, Directed edge, Weighted graph, Adjacent vertices, Self loop, Parallel edges, Multigraph, Simple graph, Complete graph, Cycle, Acyclic Graph, Isolated vertex, Degree of vertex, source node, sink node, Pendant vertex, Connected graph, strongly connected graph, weakly connected graph – MultiList – File Organization:Terminologies and concept, Structure of sequential files, Processing sequential files	

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	Fundamentals of data structures.
2.	Basic concepts related to stacks, queues.
3.	Fundamentals of graphs, multilists and file organization.

Suggested References:	
Sr. No.	References
1.	Tremblay J. & Sorenson P. G.: An Introduction to Data Structures with Applications, 2nd Edition, Tata McGraw-Hill Edition, 1991.

2.	Singh Bhagat & Naps Thomas: Introduction to Data Structures, Tata McGraw-Hill Publishing Co.Ltd.,1985.
3	R. B. Patel: Data Structure using C – Khanna Publications. ISBN: 81-87522-41-0
4	D. Samanta - Classis Data Structures, 2nd Edition – PHI Publication.
5	G. S. Baluja - Data Structures through C, 4th Edition – Dhanpat Rai & Co.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03CBCA53**	Title of the Course	**Database Management System - II**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To study the basics of Relational database design, normalization and ER diagrams. 2. To study the basics of PL/SQL, cursors, stored procedures and functions.

Course Content		
Unit	Description	Weightage* (%)
1.	**Relational Database Design** – Consequences of poor database design – Functional dependencies – Lossless joins and dependency preservation – Dr. E.F.Codd Rules – Differences between DBMS and RDBMS – The process of database normalization – 1st Normal Form, 2nd Normal Form, 3rd Normal Form, Boyce-Codd Normal Form – Examples of normalization – E-R modeling (different types of entities, attributes, relationships and their representation in the E-R diagram) – Case studies: Library (Book issue and return), Bank (Opening saving bank account)	25
2.	**Basics of PL/SQL** – PL/SQL - Introduction and advantages – Understanding PL/SQL Block structure – Fundamentals of PL/SQL Language - data types (BOOLEAN, CHAR, NUMBER, DATE, VARCHAR2), variables, constants and expressions – Operators – Conditional statements – IF and CASE statements – Controlling loop iterations – LOOP, EXIT, EXITWHEN, WHILE, FOR	25

	– Sequential control statement – GOTO and NULL	
3.	**Cursors and Exception Handling** – SELECT..INTO statement – Working with cursor : introduction, types, attributes and processing (i.e. declaring, opening, fetching and closing), using parameterized cursor – Using cursor FOR loop – Error Handling : introduction, advantages of exceptions, types of exceptions Working with user-defined exceptions – declaration, Raise_Application_Error, Pragma Exception_Init – Sqlcode and Sqlerrm	25
4.	**Stored Subprograms, Database Triggers and Packages** – Stored procedures – introduction, creating, modifying, executing and dropping procedures – Stored functions – introduction, creating, modifying, executing and dropping functions – Database triggers – introduction, creating, modifying and dropping triggers, types of triggers – Packages – meaning, advantages, creating, modifying and dropping	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand relational database design, normalization and ER diagrams.

2.	Work with PL/SQL, cursors, stored procedures and functions.

Suggested References:	
Sr. No.	References
1.	An introduction to Database Systems : Bipin C. Desai, Galgotia Poblications Pvt. Ltd.
2.	Ivan Bayross : SQL, PL/SQL The programming language of Oracle, 4th edition, BPB Publications.
3.	Kevin Loney, George Koch, Orale9i The Complete Reference , Oracle Press.
4.	Buluksu Lakshman : Oracle9i PL/SQL : A developer's guide, Apress, edition 2003.
5.	Understanding Database Management Systems : S. Parthsarthy and B.W.Khalkar, First edition 2007, Master Academy.
6.	P. S. Deshpande : SQL/PLSQL for Oracle9i, dreamtech press, reprint edition 2009.

On-line resources to be used if available as reference material
On-line Resources
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2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	US03CBCA54	Title of the Course	**System Analysis and Design**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. To understand both the nature of 'information systems analysis and design' and its various components. 2. To study the different phases of Systems Development Life Cycle (SDLC). 3. To learn systems design techniques, methodologies, and tools. 4. To study the framework of SSADM (Structured System Analysis and Design Method) with its features. 5. To understand Input/output design and fact gathering techniques. 6. To construct DFDs (Data Flow Diagrams).

Course Content		
Unit	Description	Weightage* (%)
1.	**Concepts of System, System Analysis and System Design** – Introduction to the concept of a system with examples – Elements and characteristics of systems – Types of systems – Introduction to System Analysis – Role of a System Analyst – Introduction to System Design – Comparison between System Analysis and System Design	25
2.	**System Development Life Cycle (SDLC) and Structured System Analysis and Design method (SSADM)** – Introduction to System Life Cycle (SDLC) System Analysis: Problem Identification, Feasibility study, System requirement analysis System Design: System design specification and programming, System implementation, follow up and maintenance, testing and evaluation – Introduction and need of Structured Systems Analysis and Design Method (SSADM) – SSADM Methodology: System survey, Structured analysis, Structured design, Hardware study ,System Implementation and Maintenance	25

	– Advantages of SSADM	
3.	**Fact Finding Techniques and Input/Output Design** – Introduction and need of Fact Finding Techniques – Fact Gathering Techniques : Interviewing, Questionnaires, Record Inspection and Observation techniques – Input Design: Introduction to Data Capture, Objectives of Data Capture, Steps for Data Capture, Data verification and validation – Output Design: Design Principles of Output, Output objectives, Types of Output, Various forms of Outputs	25
4.	**Data Flow Diagram and System Prototype Design** – Meaning and Significance of Data Flow Diagrams (DFDs) – Symbols used in DFDs – Rules for Constructing DFDs – Introduction and comparison between Physical and Logical DFDs – Introduction to System Prototype – Reasons for System Prototyping – Prototype Model: Diagram and Steps of Prototype Development Model – Merits and Demerits of Prototype Method	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	The concepts of System, System Analysis and System Design

2.	System Development Life Cycle (SDLC) and Structured System Analysis and Design method (SSADM)
3.	The Input / Output Design & fact finding techniques
4	Data Flow Diagrams and system prototype design

Suggested References:	
Sr. No.	References
1.	S. Parthasarthy & B. W. Khalkar : System Analysis & Design, 1st Edition, Master Ed. Cons., Nashik.
2.	James A. Senn : Analysis & Design of Information System 2nd Edition, McGraw-Hill Int.
3.	V. Rajaraman – Analysis & Design of I. S. Prentice Hall of India Private Ltd.2003.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/

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BCA (Bachelor of Computer Applications)
BCA (Semester–III)

Course Code	**US03CBCA55**	Title of the Course	**Practicals-I**
Total Credits of the Course	**4**	Hours per Week	**8**

Course Objectives:	1. To study the Object Oriented Programming concepts using C++. 2. To learn advanced concepts of C++. 3. To implement various data structures using C++.

Course Content		
Sr. No.	Description	Weightage* (%)
1.	Part-1 : Practical based on US03CBCA51	60
2.	Part-2 : Practical based on US03CBCA52	40

Teaching-Learning Methodology	Project-based learning in small groups and Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	gain knowledge of Object Oriented Programming concepts using C++.
2.	gain knowledge of advanced concepts of C++.
3.	gain knowledge of implementing various data structures using C++.

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BCA (Bachelor of Computer Applications)
BCA (Semester–III)

Course Code	**US03CBCA56**	Title of the Course	**Practicals-II**
Total Credits of the Course	**4**	Hours per Week	**8**

Course Objectives:	1. To implement basics of PL/SQL, cursors, stored procedures and functions. 2. To understand various phases of Systems Development Life Cycle (SDLC). 3. To understand context diagram and data flow diagram.

Course Content		
Sr. No.	Description	Weightage* (%)
1.	Part-1 : Practical based on US03CBCA53	60
2.	Part-2 : Practical based on US03CBCA54	40

Teaching-Learning Methodology	Project-based learning in small groups and Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	gain knowledge on implementing basics of PL/SQL, cursors, stored procedures and functions.

2.	gain knowledge on phases of Systems Development Life Cycle (SDLC).
3.	gain knowledge on context diagram and data flow diagram.

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03ABCA57**	Title of the Course	**Computer Oriented Numerical and Statistical Methods**
Total Credits of the Course	**2**	Hours per Week	**4**

Course Objectives:	1. To study the fundamentals of Computer oriented numerical methods. 2. To learn the basics of Computer oriented statistical methods.

Course Content		
Unit	Description	Weightage* (%)
	Following Methods and Topics will conduct in Practical Session. – Method of successive bisection. – Method of false position. – Method of Newton Raphson (Geometrically only) – Interpolation and Extrapolation with equal intervals – The Gregory-Newton formula for forward and backward interpolation. – Interpolation for unequal intervals using Newton's formula for divided differences. – Examples of differentiation of Linear Equation. – Higher order derivative of standard functions up to second order. – The matrix inversion method. – Examples based on Time Series- Secular trend, seasonal variation, cyclical variation and Irregular Variation. – Methods on measurement of components- the moving average method.	100%

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage

1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the computer oriented numerical methods.
2.	Understand the computer oriented statistical methods.

Suggested References:	
Sr. No.	References
1.	Sastry S.S: Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd.
2.	Salaria R.S.: Computer Oriented Numerical Methods, Book Publishing Co. Ltd., 2000(3).
3.	Fundamentals of Statistics by S.C.Gupta, Himalaya Publishing House (6).
4.	Rajaram V. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd., 1983.
5.	Murray R. Spiegel: Theory and Problem of Statistics, McGraw Hill Schaum's Outline Series, 1981.
6.	A text book of Calculus with an Introduction to differential equations by Dr. Dinesh J. Karia, Mahendra L. Patel, Roopal Prakashan Vallabh Vidyanagar.

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA58**	Title of the Course	**Digital Computer Electronics**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	To study 1. Different number systems and conversions. 2. Basic logic gates, Boolean algebra and truth tables. 3. Simplification of logic expression using laws of Boolean algebra. 4. Sequential and combinational circuits.

Course Content		
Unit	Description	Weightage* (%)
1.	**Gates and Boolean Algebra** – Logic gates (NOT, AND, OR, NAND, NOR, XOR, XNOR) - Properties and Symbolic Representation - Truth Table (up to 3 input) – De-Morgan's theorems – Simplification of logic expressions using Laws of Boolean algebra – Circuit Equivalence	25
2.	**Digital Logic Circuits-I** – Karnaugh Maps – Flip-Flop (RS, D Latch) – Decoder & Encoder	25
3.	**Digital Logic Circuits-II** – Multiplexer & Demultiplexer – Half Adder & Full Adder – Comparator – Parity Bit Generator	25
4.	**Digital Logic Circuits-III** – 4-bit binary Adder / Subtractor – Controlled Buffer Register – Shift Registers – Ring Counter	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	Different number systems and conversions.
2.	Basic logic gates, Boolean algebra and truth tables.
3.	Simplification of logic expression using laws of Boolean algebra.
4	Sequential and combinational circuits.

Suggested References:	
Sr. No.	References
1.	Malvino Brown: Digital Computer Electronics, 3rd Edition.
2.	Malvino and Leach: Digital Principles and Applications, 4th Edition.
3.	Rajaraman V: Computer Fundamentals Prentice – Hall of India Pvt. Ltd.
4.	Sinha P K: Computer Fundamentals BPB Publication (Second Edition).
5.	S K. Basandra: Computers Today Galgotia Publication
6.	Peter Norton: Introduction to Computers TMH.

7.	William H. Gothmann: Digital Electronics – An Introduction to Theory and Practice , 2nd Edition, PHI , 1982

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA59**	Title of the Course	**Management Information System**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. Management Information System (MIS) and information communication. 2. planning, decision making and elements of control.

Course Content		
Unit	Description	Weightage* (%)
1.	**MIS- Introduction** – Introduction to MIS, Function of MIS, Problems with MIS, Knowledge – requirements for MIS(7 areas) – Introduction to Information, Data – Information & management, Information Classifications – Definition: Data and Information, Data Characteristics.	25
2.	**Information Communication** – Information : introduction and its functions – Characteristics of information. – Communication System, Information in an organization. – System Concepts - Structure and elements, Objectives & types	25
3.	**Planning and Decision Making** – Planning and Planning terms, Objectives, Policies, Levels of Planning, – Planning Problems. – Type and Sources of Planning Information – Tools of planning – Decision Making, Programmed and Non-Programmed decisions, Levels of – Decision Making	25
4.	**Elements of Control** – Concept of control in management, Control cycle, Different	25

	Feedback loops, – Control in Organizations, Multiple control factors, Scope of management – Control – Total Quality Control (TQC) – Total Quality Management(TQM)	

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	Management Information System (MIS) and information communication.
2.	Planning, decision making and elements of control.

Suggested References:	
Sr. No.	References
1.	Management Information Systems, T. Lucey, BPB Publication
2.	Management Information Systems, WS Jawadekar
3	Management Information Systems, Kenneth C. Laudon, Jane P. Laudon
4	Management Information Systems, James A. O' Brien, George M. Markas

5	Management Information Systems, Ramesh Behl

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA60**	Title of the Course	**E - Commerce**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	To study the fundamentals of 1. E-Commerce and its business models. 2. Electronic market place. 3. Customer Relationship Management (CRM).

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction To E-Commerce** – Definition, communication perspective, business process perspective, service perspective – Classification by nature of transaction : B2B, B2C, C2C, C2B, Non business EC, Intra-business EC – Classification of EC Applications: electronic market, inter organizational system, customer services – Benefits to organizations, consumers, and society – Limitations of EC, framework of EC, future of EC	25
2.	**E-Commerce Business Models** – Introduction – Eight key ingredients of a business model – Major B2C and B2B business models – Introduction to M-Commerce	25
3.	**Electronic Marketplaces** – Market space components, types of electronic markets (electronic storefronts, electronic malls, types of stores and malls) – Portals and their types, role of intermediaries in E-markets, E-market success factors, competitive factors, impact of E-Market on organizations – Marketing, HR, manufacturing, finance and accounting	25

4.	**Customer Relationship Management (CRM)** – CRM : meaning, types of CRM, benefits and limitations of CRM – Issues in CRM implementation – Classifications of CRM applications – One-to-one marketing (personalization, collaborative filtering, customer loyalty, trust)	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	E-Commerce and its business models.
2.	Electronic market place.
3.	Customer Relationship Management (CRM).

Suggested References:	
Sr. No.	References
1.	Electronic Commerce : A managerial Perspective Efraim Turban, Jae Lee, David King, H Michael Chung (Pearson Education.)
2.	E-Commerce – Business, Technology, Society Kenneth C Laudon, Carol Guercio Traver (Pearson Education)

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA61**	Title of the Course	**Accounting**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	To study the fundamentals of 1. Conceptual framework of Accounting 2. Accounting cycle 3. Final accounts of sole proprietorship 4. Computerized accounting system using Tally

Course Content		
Unit	Description	Weightage* (%)
1.	**Conceptual framework of Accounting** – Definition of accounting, book keeping, need of accounting. – Some basic terms : debtor, creditor, solvent, insolvent, bad debts, bad debts recoverable, income, expenditure, trade discount and cash discount Objectives, advantages and scope of accounting. – System of book keeping, classification of accounts and rules for debit and credit.	25
2.	**Accounting Cycle** – Journal : purpose, format, ruling, Simple entry example, advantages and disadvantages. Ledger : purpose, format, posting, closing ledger accounts, advantages and disadvantages – Trial Balance : purpose, format, advantages and disadvantages	25
3.	**Final accounts of sole proprietorship** – Trading account and profit and loss account, balance sheet (each with purpose, format, examples) – Adjustment entries : interest on capital, interest of loan, depreciation on fixed assets	25
4.	**Computerized Accounting system Tally** – Introduction of Tally ERP – Creating a Company – Features & Configurations	25

	– Creating Accounting Ledgers and group – Inventory master creation	

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	conceptual framework of Accounting.
2.	accounting cycle.
3.	final accounts of sole proprietorship.
4.	computerized accounting system using Tally.

Suggested References:	
Sr. No.	References
1.	A text Book of Accounting for management by S N Maheshwari and S K Maheshwari, vikas publishing house pvt ltd.
2.	Official Guide to Financial Accounting using Tally.ERP 9 with GST By Tally Education Pvt. Ltd., BPB Publications, 2nd Revised updated Edition, 2017.
3.	Introduction to Accounting, By Maheshwari S. N. : Vikas Pub. House 1986.

4.	R.L. Gupta : Principles and practices of accounting.
5.	Rana & Dalal : Advances Accounting and Auditing :III Sudhir Prakashan Ahmedabad.

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA62**	Title of the Course	**Enterprise Resource Planning**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	To study the fundamentals of 1. ERP and related technologies. 2. ERP selection and implementation.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Introduction to Enterprise Resource Planning (ERP) – Enterprise: Introduction, Business Modeling, Integrated Data Model, Integrated Management Information – Basic concepts of ERP – Advantages of ERP	25
2.	**ERP and Related Technologies** – Business Process Reengineering (BPR) – Data warehousing, data mining and Online Analytical Processing (OLAP) – Product Life Cycle Management (PLM), – Supply Chain Management (SCM), – Customer Relationship Management (CRM)	25
3.	**ERP – Selection** – Introduction to MRP, MRP-II and ERP – ERP package selection – Risks and benefits of ERP	25
4.	**ERP – Implementation** – ERP Implementation basics – ERP Implementation Life Cycle	25

Teaching-Learning	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Methodology	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	ERP and related technologies.
2.	ERP selection and implementation.

Suggested References:	
Sr. No.	References
1.	Alexis Leon: Enterprise Resource Planning, Tata McGraw-Hill, New Delhi 1st and 2nd editions.
2.	Internet based resource.

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BCA (Bachelor of Computer Application)
BCA (Semester-III)

Course Code	**US03SBCA63**	Title of the Course	**Business Statistics**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	To study the fundamentals of 1. Basic statistical techniques and measures of central tendency. 2. Correlation and regression. 3. Permutations, combinations and probability.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Basic Statistical techniques, Frequency distribution, Forming of Frequency distribution & cumulative distribution for discrete and continuous data, Graphic representation of data, Histogram and frequency curves.	25
2.	**Measures** of Central Tendency – Measures of central tendency (for grouped & ungrouped data), Mean, Median, Mode, Harmonic mean, Geometric mean, Weighted mean, Relation between Arithmetic mean, Geometric mean and Harmonic mean, – Range, Percentile and Quartile, deviation, Standard deviation, Quartile Deviation.	25
3.	**Regression Analysis** – Method of least squares, Least- square line, correlation coefficients, rank correlation coefficients, Karl's Pearson coefficients of correlation, Linear regression, Introduction to non linear regression.	25
4.	**Permutation and Combinations** – Permutations and combinations , Elementary Probability, Conditional Probability, Independent and dependent events, mutually exclusive events, Probability distribution, Mathematical expectation.	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	Basic statistical techniques and measures of central tendency.
2.	Correlation and regression.
3.	Permutations, combinations and probability.

Suggested References:	
Sr. No.	References
1.	Fundamental of statistics – S.C.GUPTA.– Himalaya Pub. House.
2.	Statistics –D.C. Sancheti, V. K. Kapoor, Sultan Chand& Sons.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04CBCA51**	Title of the Course	**Object Oriented Programming – II**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To introduce basic programming concepts and necessary constructs of the Java programming language. 2. To understand the fundamental concepts of object-oriented programming using Java. 3. To describe exception handling and Input Output Management. 4. To understand Applet programming using Abstract Windows Toll Kit (AWT).

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Introduction to salient features of Java and Java Virtual Machine (JVM) – Structure of a Java program – Tokens, comments, constants, variables and data types, scope of variables, type casting – Operators: arithmetic, relational, logical, assignment, increment/decrement, conditional, ternary operator & special operators – Decision making: if and switch statements – Looping: while, do…while, for and for each loop – Arrays : one and two dimensional arrays	25
2.	**Classes, Objects, Interfaces and Inheritance** – Defining a class, members of a class: variables and methods, creating objects, constructors, accessing class members – Encapsulation – Static members v/s instance members – Introduction to inheritance, *this* and *super* keywords – Interfaces – Final variables, methods and classes, abstract methods and classes Introduction to method overloading and overriding	25

3.	**Exception Handling, I/O Management and Packages** – Managing errors & exceptions: introduction, types of errors, exceptions, syntax of exception handling construct, multiple catch statements, the finally clause, defining and throwing user-defined exceptions, the throw statement – Managing I/O files : introduction, concept of streams – Character stream classes – Introduction to the concept of a package, Java API packages, using the System package	25
4.	**Applet Programming** – Applet architecture and skeleton – java.awt package (Button, CheckBox, CheckBoxGroup, Choice, Color, Label, List, TextArea, TextField) – HTML applet tag, display techniques (DrawString, Lines, Rectangle, Ellipses, Circles, Arcs, Polygons, Color) – Introduction to event handling	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Understanding of the basic programming concepts and necessary constructs of the Java programming language.
2.	Understanding of the fundamental concepts of object-oriented programming using Java.
3.	Ability to describe exception handling and Input Output Management.

4.	Understanding of Applet programming using Abstract Windows Toll Kit (AWT)

Suggested References:	
Sr. No.	References
1.	Programming with Java- A Primer by E. Balaguruswami, 3rd Edition, TMH Publication.
2.	The Complete Reference – Java 2 7th Edition Herbert Schildt. TMH Publication.
3.	Saba Zame , Handbook of Object technology, CRC Press, Washington DC, 1999.
4.	Mary Campion and Kathy Walrath, Java tutorial, Second Edition, Addison Wesley Pun. 1998.
5.	Java 2 Programming Black Book, Steven Holzner.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04CBCA52**	Title of the Course	**Data Structures- II**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To study basic concepts related to tress and linked lists. 2. To learn the fundamentals of sorting and searching techniques. 3. To understand the concepts related to file organization.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to trees** – Definitions of basic terms : Tree, Directed Tree, Root, Leaf, Branch, Level, Node, Forest – Applications of a tree – Binary trees : introduction, linear and linked representations – Traversal of a binary tree: Preorder, Inorder and Postorder (Recursive) – Insertions and deletions in a lexically ordered binary tree – Types of Binary Tree : Full Binary Tree, Complete Binary Tree, Binary Search Tree	25
2.	**Linked List** – Introduction to linked lists – Types of linked lists: Singly linked lists, Doubly linked lists, Circular linked lists, Circular Doubly linked list – Operations on Singly Linked Lists: – Insertion: At Front, At Any Position, At End – Deletion: From Beginning, From Any Position, From End	25
3.	**Sorting and Searching techniques** – Sorting – Introduction, Applications of sorting – Sorting Techniques - Bubble Sort, Quick Sort and Merge Sort – Searching – Introduction, Applications of searching – Searching Techniques - Sequential search and Binary search – Sorting vs. searching	25

4.	**File Organization – II** – Hashing Functions: The Division Method, The Midsquare Method, The Folding Method, Digit Analysis, The length-Dependent Method – Collision-Resolution Techniques – Direct files, Processing direct files – The structure of indexed sequential files, Processing indexed sequential files	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Understanding of the basic concepts related to tress and linked lists.
2.	Understanding of the fundamentals of sorting and searching techniques.
3.	Ability to understand the concepts related to file organization.

Suggested References:	
Sr. No.	References
1.	Tremblay J. & Sorenson P. G.: An Introduction to Data Structures with Applications, 2nd Edition, Tata McGraw-Hill Edition, 1991.
2.	Singh Bhagat& Naps Thomas : Introduction to Data Structures, Tata McGraw-Hill Publishing Co.Ltd.,1985.

3.	R. B. Patel: Data Structure using C – Khanna Publications. ISBN: 81-87522-41-0.
4.	D. Samanta - Classis Data Structures, 2nd Edition – PHI Publication.
5.	G. S. Baluja - Data Structures through C, 4th Edition – Dhanpat Rai & Co.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04CBCA53**	Title of the Course	**Visual Programming**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic. 2. To describe the basic structure of a Visual Basic.NET project and use main features of the Integrated Development Environment (IDE). 3. To understand how to create applications using Microsoft Windows Forms. 4. To understand Exception handling. 5. To understand and create applications that use ADO. NET

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to .NET Framework (4.5) and VB.NET** – .NET Architecture, – .NET Languages, Microsoft Intermediate Language (MSIL), – The Just-In-Time (JIT) compiler, – Working with Assemblies, – The .NET framework class library VB.NET – introduction, applications and types of project – Introduction to Visual Studio IDE – Creating simple Windows Application using VB.NET Variables, data types, constants and operators Type casting, Boxing and Unboxing, Working with arrays and strings	25
2.	**Fundamentals of VB.NET** – VB.NET Basics – Use of conditional statement (if) – Multi branching statement (select) and With…End With statement, – Looping Statement: DO, FOR, FOR EACH..NEXT and WHILE, – Working with EXIT, CONTINUE and WITH statements – Working with procedures – introduction, types, use of parameters, parameter passing, calling procedures	25

	– OOP concepts - Encapsulation, Inheritance, – Interfaces and Polymorphism – Working with modules, classes (partial) and namespaces – Working with Windows Forms – introduction, life cycle, basic properties, methods and events, use of simple windows forms control. – Working with SDI and MDI forms	
3.	**Developing Windows Forms, Exception Handling** – Working with basic controls – Button, CheckBox, CheckedListBox, ComboBox, DateTimePicker, GroupBox, HScrollBar, RadioButton, VscrollBar, Label, ListBox, PictureBox, TextBox and Timer controls. – Working with advanced controls – LinkLabel, RichTextBox, ColorDiolog, FontDialog, TreeView, Error Provider Control, – Error Handling: exception, structured exception using try…catch and final statement	25
4.	**Database with ADO.NET** – Persisting Data Using Databases and Files – ADO.NET introduction, applications and architecture (connected and disconnected) – Database connectivity using ADO.NET Use of Data sources, – Server Explorer and working with DataSet Populating data in a DataGridView – Working with report	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to understand	
1.	The .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
2.	The basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).
3.	How to create applications using Microsoft Windows Forms.
4.	The basic concepts related to Exception handling.
5.	How to develop applications that use ADO. NET.

Suggested References:	
Sr. No.	References
1.	Steven Holzner; VB.NET Black Book by Dreamtech publication.
2.	Francesco Balena : Programming Microsoft Visual Basic.NET, Microsoft Press, Bill Evjen, Billy Hollis, Bill Sheldon, Kent Sharkey and Tim McCarthy : Professional VB 2005 with .NET 3.0

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04CBCA54**	Title of the Course	**Operating Systems**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To provide basic understanding of the role and functioning of an operating system. 2. To introduce the basic concepts related to processor management, memory management, process synchronization and deadlocks. 3. To impart fundamental knowledge on Linux shell environment and programming.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction and Scheduling** – Introduction to Operating System, Operating System Services – Different types of Operating Systems: Real time, Time sharing, Distributed and Multiprogramming. – OS Structure – Simple Structure, Layered Approach, Microkernel. – CPU Scheduling: Introduction to process, process control block, process scheduling, FCFS Scheduling, SJF scheduling, Priority scheduling, Round Robin scheduling	25
2.	**Memory Management** – Memory Management: Concept, Basic memory management techniques – Swapping, Paging, The concept of a Page Fault – Page Replacement Algorithms: FIFO,LRU,OPT – The concept of virtual memory – Demand Paging	25
3.	**Process Synchronization, Deadlocks and Introduction to Linux** – Introduction to Cooperating processes – Process Synchronization – Introduction to Critical Section Problem – Two process solution – The concept of a Deadlock and characterization	25

	– Introduction to Linux Operating System – Features of Linux	
4.	**Basic Linux commands** – Basic Commands: login, logout, date, man, pwd, who, dir, ls, cd, mkdir, rmdir,wc,echo – Use of Wild card characters – Types of FAP(File Access Permission), use of chmod command – Basic commands like cp, mv, rm, rev, file redirection, grep, cut, paste, find, sort commands with example – Introduction to shell script: execution of it, shell script variable, expr, test commands – Control structures: if, if..else, case structure – Iteration: while, for construct, break, continue, exit commands	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Ability to describe the role and functioning of an operating system.
2.	Understanding of fundamental concepts related to memory management, process synchronization and deadlocks.
3.	Familiarity with Linux command-line environment.
1.	Knowledge of basic Linux commands.
2.	Ability to develop Linux shell scripts.

Suggested References:	
Sr. No.	References
1.	Andrew S. Tanenbaum: Operating System deign & Implementation, Prentice Hall International
2.	James Peterson and Abraham Silberschatz: Operating System Concept, Addition Wesley
3.	Bryan Pfaffenberger - Linux Commands Instant reference , BPB Publication
4.	Sumitabha Das - UNIX , Concepts and Applications – Tata McGraw-Hill Publications
5.	Advanced Linux Programming – Samuel, Techmedia Publications

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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BCA (Bachelor of Computer Applications)
BCA (Semester–IV)

Course Code	**US04CBCA55**	Title of the Course	**Practicals-I**
Total Credits of the Course	**4**	Hours per Week	**8**

Course Objectives:	1. To solve problems using Java programming language. 2. To implement Applet Programming. 3. To implement various data structures using Java programming.

Course Content		
Sr. No.	Description	Weightage* (%)
1.	Part-1 : Practical based on US04CBCA51	60
2.	Part-2 : Practical based on US04CBCA52	40

Teaching-Learning Methodology	Project-based learning in small groups and Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	gain knowledge to solve problems using Java programming language.
2.	gain knowledge to implement Applet Programming.
3.	gain knowledge to implement various data structures using Java programming.

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BCA (Bachelor of Computer Applications)
BCA (Semester–IV)

Course Code	**US04CBCA56**	Title of the Course	**Practicals-II**
Total Credits of the Course	**4**	Hours per Week	**8**

Course Objectives:	1. To understand implementing problems using Visual Basic.NET 2. To understand implementing database programming using ADO.NET 3. To understand Operating System's working 4. To understand basics of Linux operating system.

Course Content		
Sr. No.	Description	Weightage* (%)
1.	Part-1 : Practical based on US04CBCA53	60
2.	Part-2 : Practical based on US04CBCA54	40

Teaching-Learning Methodology	Project-based learning in small groups and Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	gain knowledge in implementing problems using Visual Basic.NET.
2.	gain knowledge in implementing database programming using ADO.NET.
3.	gain knowledge in understanding Operating System's working.

4.	gain knowledge in understanding basics of Linux operating system.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04ABCA57**	Title of the Course	**Fundamentals of Operations Research**
Total Credits of the Course	**2**	Hours per Week	**4**

Course Objectives:	1. To learn about formulating a problem and different methods to solve it. 2. To understand the techniques for decision making. 3. To improve mathematical as well as logical skills.

Course Content		
	Description	Weightage* (%)
	Practicals Based on Topics – Linear Programming Problem: formulation, feasible region, Basic and Unbounded solution, Standard form. – Graphical solution (Maximization & Minimization), Simplex method (Maximization), Big M method (Maximization) – Mathematical model of Transportation Problem, Initial Basic Feasible Solution by North-West corner rule, Least-cost method and Vogel's Approximation Method (VAM). – Travelling Salesman Problem – Assignment Problem (AP), Mathematical model of AP, Solution of AP by Hungarian method (Balance & minimization). – Dynamic programming, Deterministic & Probabilistic dynamic programming (types only), shortest route problem. – Sequencing problem, N-jobs through 2 machines – Applications of PERT & CPM, Rules for Network construction, Critical path calculations, Total & Free float.	100

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr.	Details of the Evaluation	Weightage

No.		
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand how formulate the problem and different methods to solve it.
2.	Understand the techniques for decision making.
3.	Understand how to improve mathematical as well as logical skills.

Suggested References:	
Sr. No.	References
1.	Sharma S.D.: Operations Research. KedarNath Ram Nath & Co. Meerut, 1988-89. (fifteenth edition)
2.	Operation Research (For managerial decision making) 5th revised edition by V. K. Kapoor, Sultan Chand & sons.
3.	J.K.sharma: Operation Research.
4.	Gillett B. E.: Introduction to Operations Research - a computer oriented algorithmic approach, McGraw-Hill, 1976.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA58**	Title of the Course	**Multimedia Technology**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. To introduce fundamental concepts related to multimedia technology. 2. To provide basic understanding of working with text, audio, video and graphics. 3. To impart basic knowledge on multimedia animation. 4. To introduce various multimedia authoring systems. 5. To impart knowledge on development of various multimedia applications.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Multimedia : meaning – Various facets of multimedia : text, audio, video, animation graphics – Classification of multimedia technology – Multimedia : hardware/software essentials, different categories of multimedia software.	25
2.	**Working with Text, Audio** – Multimedia Text: Introduction, designing text for multimedia, hypermedia, hypertext – Multimedia Audio : Introduction, digital audio and sound card fundamentals, sound card functionalities, audio jacks, connectors, digital audio playback, audio editing	25
3.	**Working with Graphics and Video** – Multimedia Graphics : Introduction, basic concepts of color displays, color depth, Resolution, Digital Imaging, Camera specification, Graphics editing concepts. – Multimedia Video : Introduction, video in multimedia projects, digital video fundamental, full motion and full screen videos,	25

	digital video files sizes, digital video production techniques – video production in multimedia, shooting the sequences, video capture techniques, video capture boards, video capture software, editing video, embedding sound clips.	
4.	**Multimedia Animation, Project and Authoring** – Multimedia Animation: introduction, classifications, two-dimensional animation and three dimensional animation technology, animation development process, names of animation software tools for 2D and 3D – Multimedia project design concepts – introduction, concept and design, various facets, media content design and development, interface design and development process. – Multimedia authoring: introduction, authoring methodologies, characteristics of authoring tools, Commercial authoring tools.	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand fundamental concepts related to multimedia technology.
2.	understand how to work with text, audio, video and graphics.
3.	discuss the concepts related to multimedia animation and multimedia authoring systems.
4.	develop various multimedia applications.

Suggested References:

Sr. No.	References
1.	Multimedia Magic. By S. Gokul, BPB Publications, 1998 and (Revised and updated Second Edition) 2005.
2.	Introduction to Multimedia : By Ana Weston Solomon, Tata McGraw-Hill Publishing Company Limited, 2005.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA59**	Title of the Course	**Business Information Systems**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. To learn Business Information System (BIS), its feature and component. 2. To learn strategy of IT Infrastructure and corporate Environment. 3. To understand of Business Functions and Information Needs of Business. 4. To introduce Managerial Process with Implications for Information System. 5. To introduce planning for IT Infrastructure for best Business. 6. To identify IT applications and Assessing Risk In Realization of Benefits.

Course Content		
Unit	Description	Weightage* (%)
1.	**Business Information System** – Introduction to BIS – Features of BIS – Users of BIS. – Components of BIS. – Characteristics, Features of new IT Infrastructure – Changing the corporate environment.	25
2.	**Business Functions and Information Needs of Business** – Introduction to Basic Business Functions. – Marketing Function and Information Needs. – Finance Function and Information Needs. – Production Function and Information Needs. – Human Resource Management and Information Needs. – Information Management as Business Function.	25
3.	**Information System and Managerial Process** – Introduction to Managerial Process.	25

	– Managerial Decision Making – Approaches to Managerial Decision Making – Decision Making Environment. – Implications for Information System.	
4.	**Planning for IT Infrastructure** – Introduction – Portfolio Approach. – Identifying IT applications. – Techniques of Evaluating IT Investments. – Assessing Risk In Realization of Benefits.	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	the basic concepts related to Business Information Systems.
2.	various business functions and information needs of a business.
3.	various managerial processes and information systems.
4.	necessary planning for IT infrastructure.

Suggested References:	
Sr. No.	References
1.	Business Information System, Muneesh Kumar, Publisher : Vikas Publishing House

	Pvt Ltd.
2.	Introduction to Information Technology, Turban, Rainer, Potter, John Wiley & Sons Inc., 2000

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA60**	Title of the Course	**System Software**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. To study the fundamental concepts related to system software. 2. To learn basics of language processors and compilers. 3. To understand the fundamentals of an assembly Language and the role of an assembler. 4. To study basics of editors, macros, linkers, and loaders. 5. To discuss various system software tools.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction to Language Processors and Compilers** – Classification of Software, Introduction to System Software, Overview of Addressing Modes and Instruction Formats, Concept of Execution by OS and Executable Files, Language Processing Activities, Phases of Compilation Process, Compiler vs. Interpreter, Cousins of a Compiler	25
2.	**Fundamentals of Assembly Language and Assemblers** – Elements of Assembly Language Programming, A Simple Assembly Language Scheme, Description of different types of Assembly Language Statements: Imperative Statements, Declaration Statements, Assembler Directives, Advantages of Assembly Language, Forward Reference, Pass and Types of Assemblers	25
3.	**Editors, Macros, Linkers, and Loaders** – Editors: Overview of the Editing Process, Types of Editors: Line Editors, Stream Editors, Screen Editors, Word Processors, Structure Editors, Syntax Directed Editor, Design of Editors/Editor Structure – Linkers: Introduction: Translated, Linked and Load Time Addresses, Relocation and Linking Concepts, Program Relocation,	25

	Self-Relocating Program – Loaders: Basic functions of Loader, Types of Loaders – Macros: Macro Definition and Call, Macro Expansion	
4.	**System Software Tools** – Language Processor Development Tools: Introduction to Software Tools for Program Development and their description – Debug Monitors: Interactive Debugging System and its usefulness, Debugging Functions and Information – User Interface: Design Criteria and Examples – Device Driver: Role of Device Drivers, Examples of Device Drivers	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand the fundamental concepts related to system software.
2.	discuss basics of language processors and compilers.
3.	understand the basics of an assembly Language and the role of an assembler.
4.	understand the basics of editors, macros, linkers, and loaders.
5.	discuss various system software tools.

Suggested References:	
Sr.	References

No.	
1.	Dhamdhere D. M., "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill Company Limited, 2004.
2.	Leland L. Beck, "System Software - An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.
3.	Dhamdhere, Introduction to System Software, McGraw Hill.
4.	Aho. A.V., Sethi R. and Ulman J.D, "Compilers, Principles, Techniques and Tools", Addition-Wesley Publishing Company, 1988/Pearson.
5.	Srimanta Pal, Systems Programming, Oxford University Press. John Donowan, System Programming, TMH.
6.	Leland L. Beck and D. Manjula, System Software-An Introduction to Systems Programming, Pearson.
7.	Das, Compiler Design Using Flex and Yacc, PHI.
8.	John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.
9.	John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA61**	Title of the Course	**Artificial Intelligence**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. To introduce the term Artificial Intelligence and its related domains. 2. To study basic concepts related to expert systems. 3. To learn various search methods. 4. To understand various knowledge representation methods. 5. To introduce various application areas of AI such as Natural Language Processing, game playing, and robotics.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Concepts and Definitions of AI – Brief history of AI – AI and related fields	25
2.	**Expert Systems** – Introduction – Characteristics of Expert System – Representing and Using Domain knowledge – General Structure of Expert Systems – Expert System Shell – Advantages and Disadvantages of Expert system	25
3.	**Introduction to AI techniques and Application Areas-I** – Introduction to Basic search strategies: Some examples and Classification – Introduction to Heuristic Search technique: Depth First Search – Using Predicate Logic – Representing simple facts in logic, video, embedding sound clips.	25
4.	**Introduction to AI techniques and Application Areas-II** – Introduction to Fuzzy logic	25

	– Introduction to various application areas of AI like: Natural Language Processing, Game Playing, Robotics	

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	the term Artificial Intelligence and its related domains.
2.	basic concepts related to expert systems.
3.	various search methods.
4.	various knowledge representation methods.
5.	various application areas of AI such as Natural Language Processing, game playing, and robotics.

Suggested References:	
Sr. No.	References
1.	Elain Rich : Artificial Intelligence,McGraw Hill, 2001.
2.	Patterson, Dan W. : Introduction to Artificial Intelligence, Prentice Hall of India (PHI).
3.	R.Akerkar : Introduction to Artificial Intelligence, PHI, 2005

4.	S. Russell and P. Norvig, Modern Approach to Artificial Intelligence, Prentice Hall of India Ltd., 2006.
5.	George Luger, Artificial Intelligence, 5th Edition, Addison Wesley, 2004.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA62**	Title of the Course	**System Security**
Total Credits of the Course	**4**	Hours per Week	**4**

Course Objectives:	1. To acquire basic knowledge about security attacks, security services and a network security model. 2. To understand the fundamental concepts related to cryptography. 3. To develop understanding about the concepts related to viruses. 4. To acquire basic knowledge about digital signatures and firewalls.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Security attacks – Security services – security mechanisms – A model for network security	25
2.	**Cryptography** – Introduction – Conventional encryption principles – Basic terms : plaintext, cipher text, cryptography, cryptanalysis – Substitution ciphers vs. transposition ciphers – Introduction to secret key algorithms and public key algorithms	25
3.	**System Security** – Intruders – Viruses and related threats : trap doors, logic bombs, Trojan horses – worms – The nature of viruses – Types of viruses – Antivirus approaches : detection, identification and removal	25
4.	**Network Security** – Digital signatures	25

	– Firewalls : introduction, design principles, characteristics, types, configuration	

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Basic knowledge about security attacks, security services and a network security model.
2.	Understanding of the fundamental concepts related to cryptography.
3.	Understanding about the concepts related to viruses.
4.	Fundamental knowledge about digital signatures and firewalls.

Suggested References:	
Sr. No.	References
1.	William Stallings: Network Security Essentials (Applications and Standards), Pearson Education India, 2001.
2.	Behrouz Forouzan, Introduction to Data Communications and Networking, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1998.

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BCA (Bachelor of Computer Application)
BCA (Semester-IV)

Course Code	**US04SBCA64**	Title of the Course	**Software Project Management**
Total Credits of the Course	**2**	Hours per Week	**2**

Course Objectives:	1. To develop understanding about the concepts related to software project management. 2. To learn the phases of a software project life cycle. 3. To acquire knowledge about a software process, project metrics and software project planning. 4. To understand software project estimation and risk management. 5. To study the concepts related to project scheduling and tracking.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Overview of a Project, Project types and operations, Program, Portfolio and Management – Characteristics and Goals of a Project – Project Execution and Stakeholders – Project Management with its cross functional nature – 4P's for effective Project Management – Principles of Project management – Software Project Life cycle phases	25
2.	**Software Process, Project Metrics and Software Project Planning** – Overview of Measures, Metrics, And Indicators – Metrics in the Process And Project Domains – Software Measurement – Metrics For Software Quality – Project Planning Objectives – Software Scope: Obtaining necessary information and Feasibility – Resources	25
3.	**Software Project Estimation and Risk Management** – Software Project Estimation	25

	– Decomposition techniques: Software sizing, Problem based estimation, Process based Estimation – Empirical estimation models: COCOMO model – Concept of Risk, Type of Risks – Risk Identification with Components and drivers – Risk Assessment – Risk Mitigation, Monitoring and Management	
4.	**Project Scheduling and Tracking** – Introduction to Project Scheduling – Principles guide for Software Project Scheduling – Work Breakdown Structure(WBS) – Selecting Software Engineering Task – Concept of Task network and Scheduling Tool: Timeline Chart (Gantt Chart) – Concept and ways of Tracking the schedule	25

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understanding about the concepts related to software project management.
2.	ability to describe the phases of a software project life cycle.
3.	knowledge about a software process, project metrics and software project planning.
4.	understanding about software project estimation and risk management.
5.	ability to discuss the concepts related to project scheduling and tracking.

Suggested References:	
Sr. No.	References
1.	Roger S. Pressman, "Software Engineering", 2001, McGraw Hill.
2.	S.A.Kelkar, "Software Project Management – A concise study", 2nd Ed. PHI learning Pvt. Ltd. 2009.
3.	Walker Royce, "Software Project Management – A Unified Framework", 2001, Pearson Education.
4.	Ian Sommerville, "Software Engineering", 2004, Addison Wesley.
5.	Pankaj Jalote "An Integrated Approach to Software Engineering" 2nd Edition.

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