IMS UNISON
UNIVERSITY
Nurturing Knowledge. Empowering Minds.

Bachelor of Computer Applications (BCA)
(Three-Year, Semester Based, Full Time Program)

PROGRAM STRUCTURE

Programme Curriculum	Credit Recommended by UGC	Credit offered by IUU	Courses
Maximum Credits on offer in the BCA Program	120	157	51
The structure of Credit requirements is shown below:			
Total Number of Major Courses (CORE)	60	62	21
Total Number of Minor Courses	22	48	14
Multi Disciplinary Course (MDC)	9	6	2
Ability Enhancement Courses (AEC)	8	8	3
Skills Enhancement Courses (SEC)	9	12	4
Value Added Courses (VAC)	8	15	5
Summer Internship Project	4	6	2

Semester-I

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	T	P		
1	BCA 101	IT Tools for Statistics	4	0	0	4	Major
2	BCA 102	Digital Electronics	4	0	0	4	Minor
3	BCA 103	Computer Fundamentals	4	0	0	4	Minor
4	BCA 104	Basic Mathematics	3	1	0	4	VAC
5	BCA 105	English Communication - I	2	1	2	4	AEC
6	BCA 101P	IT Tools for Statistics Lab	0	0	4	2	Major
7	BCA 102P	Digital Electronics Lab	0	0	4	2	Major
8	BCA 103P	Computer Fundamentals Lab	0	0	4	2	Minor
		Total Credits	17	2	14	26	
		Total Contact Hours	33				

Co-curricular & Extra Curricular Activities IT Lab (2) + University/School Outdoor Activity (1)	33+3=36	

Semester-II

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	T	P		
1	BCA 106	Programming with C	4	0	0	4	Major
2	BCA 107	Data Structures using C	4	0	0	4	Major
3	BCA 108	Operating Systems with Linux	4	0	0	4	Minor
4	BCA 109	Discrete Mathematics	3	1	0	4	SEC
5	BCA 110	Computer Architecture	3	1	0	4	Minor
6	BCA 111	English Communication - II	1	0	2	2	AEC
7	BCA 106P	Programming with C Lab	0	0	4	2	Major
8	BCA 107P	Data Structures using C Lab	0	0	4	2	Major
9	BCA 108P	Operating Systems with Linux Lab	0	0	2	1	Minor
		Total Credits	19	2	12	27	
		Total Contact Hours	33				
Co-curricular & Extra Curricular Activities IT Lab (2) + University/School Outdoor Activity (1)			33+3=36				

SEMESTER-III

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	T	P		
1	BCA 201	Relational Data Base Management Systems	4	0	0	4	Major
2	BCA 202	Programming with Java	4	0	0	4	Major
3	BCA 203	Computer Based Numerical Methods	3	0	0	3	SEC
4	BCA 204	Software Engineering	4	0	0	4	Major
5	BCA 205	Data Communication and Networking	4	0	0	4	Minor
6	BCA 201P	Relational Data Base Management Systems Lab	0	0	4	2	Major
7	BCA 202P	Programming with Java Lab	0	0	4	2	Major

8	BCA 203P	Computer Based Numerical Methods Lab	0	0	2	1	SEC
9	BCA 206P	Business Communication and Etiquette Lab	0	0	4	2	VAC
		Total Credits	**19**	**0**	**14**	**26**	
		Total Contact Hours		**33**			
Co-curricular & Extra Curricular Activities IT Lab (2) + University/School Outdoor Activity (1)				**33+3=36**			

SEMESTER-IV

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	T	P		
1	BCA 207	Web Technologies	4	0	0	4	Major
2	BCA 208	Computer Graphics	3	0	0	3	Minor
3	BCA 209	Python Programming	3	0	0	3	Major
4	BCA 210	E-Commerce	4	0	0	4	VAC
5	BCA 211	Organizational Behaviour	4	0	0	4	MDC
6	BCA 212	Personality Development and Soft Skills	1	0	2	2	AEC
7	BCA 207P	Web Technologies Lab	0	0	4	2	Major
8	BCA 208P	Computer Graphics Lab	0	0	4	2	Minor
9	BCA 209P	Python Programming Lab	0	0	4	2	Major
		Total Credits	**19**	**0**	**14**	**26**	
		Total Contact Hours		**33**			
Co-curricular & Extra Curricular Activities IT Lab (2) + University/School Outdoor Activity (1)				**33+3=36**			

SEMESTER-V

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	T	P		
1	BCA 301	Artificial Intelligence	4	0	0	4	Major
2	BCA 302	Fundamentals of Accounting	2	0	0	2	MDC
3	BCA 303	Business Intelligence	3	0	2	4	SEC

4	-	Elective –I (Advanced Programming)	2	0	4	4	Minor
5	-	Elective -II	3	1	0	4	Minor
6	BCA 301P	Artificial Intelligence Lab	0	0	2	1	Major
7	BCA 304P	Written Analysis & Communication	2	0	2	3	VAC
8	BCA 305P	Project-I	0	0	6	3	Dissertation
		Total Credits	**16**	**1**	**16**	**25**	
		Total Contact Hours		**33**			
Co-curricular & Extra Curricular Activities IT Lab (1) + Field Visit / Data Collection (2)				**33+3=36**			

SEMESTER-VI

Sr No	Course Code	Course Name	Periods			Credits	Category
			L	**T**	**P**		
1	BCA 306	Data Warehouse and Data Mining	4	0	0	4	Major
2	BCA 307	Data Analysis with R	4	0	0	4	Major
3	-	Elective-I (Advanced Programming)	2	0	4	4	Minor
4	-	Elective -III (Same as of Elective II Group)	3	1	0	4	Minor
5	-	Elective -III (Same as of Elective II Group)	3	1	0	4	Minor
6	BCA 307P	Data Analysis with R Lab	0	0	4	2	Major
7	BCA 308P	Project-II	0	0	6	3	Dissertation
8	BCA 309P	Career Skills	0	0	2	2	VAC
		Total Credits	**16**	**2**	**16**	**27**	
		Total Contact Hours		**34**			
Co-curricular & Extra Curricular Activities IT Lab (6)				**34+2=36**			

LIST OF ELECTIVES

Group I (Advanced Programming)						
Sr No	**Course Code**	**Course Name**	**Periods**			**Credits**
			L	**T**	**P**	
1	BCA-AP101	Dot Net Technology	2	0	4	4
2	BCA-AP102	Advanced Java Programming	2	0	4	4
3	BCA-AP103	Mobile Programming	2	0	4	4
4	BCA-AP104	Advanced Web Technology with PHP	2	0	4	4

Group II (Cloud Technology & Information Security)						
Sr No	**Course Code**	**Course Name**	**Periods**			**Credits**
			L	**T**	**P**	
1	BCA-CI101	Network Security and Cryptography	3	1	0	4
2	BCA-CI102	Virtualization and Cloud Computing	3	1	0	4
3	BCA-CI103	Wireless Communications and VOIP Security	3	1	0	4
4	BCA-CI104	Ethical Hacking and Cyber Law	3	1	0	4

Group III (Business Analytics)						
Sr No	**Course Code**	**Course Name**	**Periods**			**Credits**
			L	**T**	**P**	
1	BCA-BA101	Machine Learning	3	1	0	4
2	BCA-BA102	Generative AI	3	1	0	4
3	BCA-BA103	Low Code No Code	3	1	0	4
4	BCA-BA104	Software Testing	3	1	0	4

Notes:

1. A student shall select a course for Elective-I only from the List of Elective Group-I (Advanced Programming) and for Elective-II and Elective-III from Group-II (Cloud Technology and Information Security) and Group-III (Business Analytics). A student selecting one group say X in Semester V for Elective-II then Elective-III can only be selected from same group X in Semester VI.

2. A student shall do his/her project in the elective area chosen. The topic of the Project must be finalized before Semester IV End Term Examination in consultation with the faculty members.

SEMESTER-I

Course: IT Tools for Statistics				Semester: I
Course Code : BCA 101	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	This course acquaints students with various statistical methods and cultivates statistical thinking among students by giving hands-on experience in data analysis platforms like MS-Excel.
LEARNING OUTCOME	**After competing this course, you will be able to:** 1. Distinguish types of studies and their limitations and strengths, 2. Describe a data set including both categorical and quantitative variables to support or refute a statement, 3. Perform statistical inference in several circumstances and interpret the results in an applied context, 4. Use mathematical tools, including calculus and linear algebra, to study mathematical statistics and in the description and development of statistical procedures, 5. Use a statistical software package for computations with data.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to Statistics, Classification and Presentation of Data** Definition of statistics, Importance and scope of statistics in business decisions, Limitations, Difference between samples and populations, Methods of data collection: primary and secondary data, Tabulation of data, Frequency distributions, Constructing a frequency distribution, Graphing frequency distribution: histograms, frequency polygons. Measurement and scaling concepts.	15
	2	**Measures of Central Tendency** Concept of central tendency, Measures of central tendency: The arithmetic mean, properties of arithmetic mean, weighted mean, median, and mode, Lab exercises on Excel.	10
	3	**Measures of Dispersion** Concept of dispersion, Range, Inter-Quartile Range, Average Deviation, Mean Deviation, Median deviation, Standard Deviation, Skewness and Kurtosis. Lab exercises on MS Excel.	12
	4	**Simple Regression and Correlation** Introduction, Types of relationships between two (or more) variables, Scatter diagrams, Karl Pearson's coefficient of correlation and Spearman's rank correlation coefficient,	13

		Estimation using the regression line. Time Series Forecasting (secular trend). Lab exercises on MS Excel & SPSS.	
	5	**Fundamentals of Probability and Distribution**	10
		Introduction, Concepts of Probability, Definition, concepts of combination and permutation, Rules of Probability, Discrete Probability Distribution (Binomial, Poisson), Continuous Probability Distribution (Normal, Uniform).	
		Total Hours	**60**
TEXT BOOK	1.	Levin, Richard. I, Rubin, David. S, Rastogi, Sanjay, Siddiqui, Masood Husain; Statistics for Management; Pearson.	
REFERENCE BOOK/ SUGGESTED READING	1. Ken, Black; Business Statistics For Contemporary Decision Making; Wiley. 2. Aczel, Amir. D, Sounderpandian, J, Saravanan, P; Complete Business Statistics; McGraw Hill Education. 3. Carver, R. H., Nash, J.G.; Doing Data Analysis with SPSS; Cengage learning,		

Course: DIGITAL ELECTRONICS				Semester: I	
Course Code: BCA 102		**L T P**	**4 0 0**	Credits: 4	

OBJECTIVE	To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits and prepare students to perform the analysis and design of various digital electronic circuits.		
LEARNING OUTCOME	After studying this course, the students would gain enough knowledge. 1. To understand and examine the structure of various number systems and its application in digital design. 2. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics. 3. The ability to understand, analyze and design various combinational and sequential circuits. 4. Ability to identify basic requirements for a design application Registers and Counters. 5. The ability to identify and understand the working of various Memories.		
COURSE DETAILS	Module No.	Topic	Hours
	1	**Number Systems** Binary number system, Octal and Hexa-decimal number system, Conversion of number system, r's and (r-1)'s complement, Arithmetic operations on binary numbers	10
	2	**Logic Gates Boolean Algebra Simplification** AND, OR, NOT GATES and their truth tables, NOR, NAND and XOR gates, AND, OR, Inversion, Basic Boolean law's, Demorgan's theorem. K - Map, Sum of product and Product of sum forms.	12
	3	**Combinational Circuits and Sequential Circuits** Multiplexers, Demultiplexers, Decoders and encoders, Half adder, Full adder, Half subtractor, Full subtractor, Sequential circuits classification, Parity checker, Code converters, Types of flip flop: R-S, D, J-K, T, Master slave.	14
	4	**Registers and Counters** Types of registers: shift registers, universal shift register with parallel load, and bi-directional shift register, Counter: synchronous counter, ripple counter, binary counter, decimal counter.	14
	5	**Memory** Auxiliary memory, Associative memory, Cache memory, Virtual memory.	10

		Total Hours	60
TEXT BOOK	1. Mano, M.M.; Digital Logic and Computer Design; Pearson Education.		
REFERENCE BOOK/ SUGGESTED READING	1. Taub, H. and Schilling, D. L.; Digital Integrated Electronics; McGraw-Hill. 2. Givone, D.P.; Digital Principles and Design; McGraw-Hill. 3. Bartee, T. C.; Digital Computer Fundamentals; McGraw-Hill. 4. Malvino, A. P., Brown, J. A.; Digital Computer Electronics; McGraw-Hill.		

Course: COMPUTER FUNDAMENTALS			Semester: I
Course Code : BCA 103	L T P	4 0 0	Credits: 4

OBJECTIVE	The main objective of this course is to introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet and networking. It focuses on such computer literacy that prepares students for life-long learning of computer concepts and skills. Students discover why computers are essential components in education, business, and society.
LEARNING OUTCOME	After successfully completing this course, a student will be able to: 1. Converse in basic computer terminology and evolutions. 2. Formulate opinions about the impact of computers on society and understand the basics peripherals of computers. 3. Understand the application of computer languages and sofwares. 4. Possess the knowledge of basic computer languages and software's. 5. Know and use internet and its applications.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Computer Evolution** Characteristics of computers, Evolution of computers, Generation of computers, Classification of computers, Computer system, Applications of computers, Introduction to developing a program, Algorithm, Flowchart, Pseudo code (P-Code).	15
	2	**Input-Output Devices** Memory hierarchy, Random Access Memory (RAM), Types of RAM, Read Only Memory (ROM), Types of ROM. Classification of secondary storage devices, Magnetic tape, Magnetic disk, Optical disk, Magneto optical disk, Keyboard, Pointing devices, Speech recognition, Digital camera, Scanners, Optical scanners, Classification of output, Hard copy output devices, Printers, Plotters, Computer Output Microfilm (COM), Soft copy output devices, Monitors, Audio output, Projectors, Terminals.	10
	3	**Computer Languages and Software's** Computer programming languages: machine language, assembly language, and high level language, 4 GL: merits and demerits, Software and its need, Types of software: System software, Application software, Operating System, Utility Program, Assembler, Compiler and interpreter. Introduction, Evolution of operating system, Types of operating system, Functions of an operating system, Modern operating systems.	15

	4	**MS-Office**	14
		Basic introduction and use of MS-Word, features of MS Word, formatting tools, mail merge applications, MS-Excel, featers of MS Excel, use of basic functions, MS-Power Point, animation and transition.	
	5	**Internet**	06
		The evolution of Internet, Network concepts, Uses of the Internet, applications of Internet: e-mail, WWW, FTP, TELNET, USENET NEWS.	
		Total Hours	**60**
TEXT BOOK	1.	Norton's, P; Computing Fundamentals; McGraw-Hill	
REFERENCE BOOK/ SUGGESTED READING	1. Balagurusamy, E.; Fundamentals of Computers; McGraw-Hill. 2. Williams, B. and Sawyer, S.; Using Information Technology; McGraw-Hill. 3. Curtain, D. and Sen, K. and Foley, K.; Information Technology; McGraw-Hill 4. Sinha, P. K and Sinha, P.; Computer Fundamentals; BPB Publications.	

Course: Basic Mathematics				Semester: I
Course Code : BCA 104		L T P	3 1 0	Credits: 4

OBJECTIVE	To acquire the knowledge of fundamentals of mathematics to make them ready to apply these mathematical concepts and application to solve different problems		
LEARNING OUTCOME	**On successful completion of the course the learners will be able to:** 1. Familiar with Determinant and Matrices and its application. 2. Familiar with logarithms and concepts of permutation and combination and its applications. 3. Formulate and understand the concepts of Limit and Continuity. 4. Formulate the concepts basic Differentiability and its applications. 5. Demonstrate a working knowledge of Definite and Indefinite Integrals.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**MATRICES:** Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramer's Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix.	12
	2	**Logarithm and Combinatorics:** Definition of logarithms, properties, basic laws of logarithms, definition of permutation, properties of permutation, application, combination, Combination, properties and applications.	12
	3	**Limits and Continuity:** Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities	12
	4	**DIFFERENTIATION:** Derivatives, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation.	12
	5	**INTEGRATION:** Integral as Limit of Sum, Fundamental Theorem of Calculus (without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions.	12
		Total Hours	**60**

TEXT BOOK	1. B.S. Grewal, "Elementary Engineering Mathematics", BPP publication.
	2. Shanti Narayan, "Integral Calculus", S. Chand & Company
REFERENCE BOOK/ SUGGESTED READING	1. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Comp
	2. J.P. Chauhan "BCA Mathematics Volume -1", Krishna Publications

Course: English Communication -I			Semester: I	
Course Code: BCA 105	**L T P**	**2 1 2**	**Credits: 4**	

OBJECTIVE	To enhance students' ability to communicate effectively in the business world with special focus on writing and speaking skills. Students will develop effective speaking skills and learn to draft formal documents. They will also develop relevant soft skills in order to be effective in the corporate world.	
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Demonstrate skills related to the corporate world. 2. Learn the basics of formal communication. 3. Develops other essential skills required for the smooth functioning of any organization. 4. Create and effectively deliver oral presentations. 5. Demonstrate an understanding of global perspectives of business.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Fundamentals of Communication:** Features of Indian/ colloquial English – Correction of sentences – structures of sentences – Tenses – identifying clichés and removing ambiguity – Idiomatic/phrasal distortions. Informal conversation Vs Formal expression, Types of Verbal Communication. Identifying barriers to effective communication and effective ways to overcome the barriers	12
	2	**Business Communication/ Correspondence** Business Correspondence – Principles, Features, Types, Formats and layout of Business Letter. Types of Business Correspondence – Letters of Enquiry, Quotation, Order, Instructions, Sales, Credit, Complaint, Adjustment, Collection, etc. Some more types of Business Correspondence-- Notice, Agenda, Minutes, Memorandum. Job Application letters -- Covering letter, Resume, Bio-data and C.V.	12
	3	**Business Proposal and Business Report** Business Proposal – Introduction, purpose, features, types, format, importance, process of preparation. Writing Business Proposals. Business Report -- Features, Types, Style, Format, Relevance. Writing Business Reports.	12

	4	**Soft Skills**	12
		Kinesics, Para language, Proxemics. Presentation skills - Features, Types, Structure, Aids and Importance. Group Discussion skills - Features and Importance.	
	5	**Effective Presentation Skills**	12
		a. Management presentations – types of presentation – video conferencing – participation in meetings – chairing sessions.	
		b. Formal and informal interviews- ambience and polemics – interviewing in different settings and for different purposes e.g. eliciting and giving information, recruiting, performance appraisal.	
		Total Hours	**60**
TEXT BOOK	1. Chaturvedi, Courtland L., Bovee J.V, Thill, Mukesh; Business Communication Today, Pearson		
	2. Raymond V. Lesikav, John D. Pettit Jr.: Business Communication; Theory and Application, All India Traveller Bookseller, New Delhi		
	3. Shirley Taylor and Chandra, V.; *Communication for Business*; Pearson Education		
REFERENCE BOOK/ SUGGESTED READING	1. Rentz, Flatley and Lentz. Lesikar's Business Communication Connecting in a Digital World. New York. McGraw-Hill Irwin.		
	2. Basic Communication Skills for Technology, Andre J. Rutherford: Pearson Education Asia		
	3. Edmund H Weiss: Writing Remedies: Practical Exercises for Technical Writing. Universities Press, Hyderabad		
	4. Ronald E. Duleck and John S. Fielden.; *Principles of Business Communication*. Macmillan.		
	5. Herta A Murphy and Herbert W. Hildebrandt.; Effective Business Communication; McGraw-Hill, Inc.		

Course: IT TOOLS FOR STATISTICS LAB			Semester: I
Course Code: BCA 101P	L T P	0 0 4	Credits: 2

OBJECTIVE	To develop practical skills and confidence of statistical methods using MS Excel.

Suggested List of Practical's
1. Calculate mean, median, mode and display results in proper format.
2. Calculate the product and sum of two vectors.
3. Calculate Range, quartile deviation, standard deviation and coefficient of variation for grouped data.
4. Partition values-quartiles for grouped and ungrouped data and display formatted results.
5. Data Base Creation (including vector, matrix, data frames).
6. Graphical representation (Bar, Pie, Line, Histogram, Scatter).
7. Cross tabulation and Descriptive Statistics.
8. Implement Correlation.

Course: DIGITAL ELECTRONICS LAB				Semester: I
Course Code : BCA 102P	**L T P**		**0 0 4**	Credits: 2

OBJECTIVE	To impart practical knowledge about electronics and its applications in computers.

Suggested List of Practical's

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates, Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder.
3. Half Subtractor / Full Subtractor.
4. Parallel Adder / Subtractor: Perform adder and subtractor operation using IC7483 chip.
5. 4-Bit Binary-to-Gray and Gray-to-Binary Code Converter: Realization using XOR gates.
6. 4-Bit and 8-Bit Comparator: Implementation using IC7485magnitude comparator chips.
7. Multiplexer: Truth-table verification.
8. Demultiplexer: Truth-table verification.
9. LED Display: Use of BCD to 7 Segment decoder / driver chip to drive LED display.
10. Encoder: Truth table verification and realization.
11. Decoder: Truth Table verification and realization.
12. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF using IC7476 chip.
13. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 and IC7493 chip.
14. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter using IC74192 andIC74193 chip.
15. Shift Register: Study of shift right (SIPO, SISO, PIPO, PISO) and Shift left operations using IC7495 chip

Course: COMPUTER FUNDAMENTALS LAB				Semester: I
Course Code : BCA 103P	L T P		0 0 4	Credits: 2

OBJECTIVE	To impart practical knowledge about MS-Office software's like MS-Word, MS-Excel, MS-PowerPoint and working of Internet.

Suggested List of Practical's

MS-Word

1. Starting Word, Excel and PowerPoint
2. Elaboration of MS Word IDE and its uses
3. Basic formatting tools and application of MS word
4. Items Covered in This Lab
5. Use Nested Folders
6. Open a Document
7. Save a Document
8. Understand Show/Hide Format
9. Use Basic Keyboard Functions
10. Practice Basic Text Entry
11. Create a Simple Bulleted List
12. Use the Zoom function.

MS Excel:

1. Create a grade report card.
2. create employee's salary sheet
3. Use of Mathematical function.
4. Use of stastical function
5. Use of most frequentaly used financial functions
6. Use most frequemntaly used Text function.
7. Use of conditional functions.
8. Use of special function like Vlookup and Hlookup

MS PowerPoint:

1. Creating power point presentation.
2. Applying animation and transition feature

SEMESTER II

Course: PROGRAMMING WITH C			Semester: II
Course Code: BCA 106	**L T P**	**4 0 0**	Credits: 4

OBJECTIVE	To impart knowledge about basic concepts of procedure-oriented programming with focus on designing applications using C.		
LEARNING OUTCOME	After competing this course, you will be able to: 1. Develop a C program to understand the fundamentals of programming. 2. Control the sequence of the program and give logical outputs. 3. Implement various data structures like Array, Structure, and functions in your C program. 4. Apply code reusability with functions and pointers. 5. Understand the basics of file handling mechanisms.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction to 'C' Programming Language** History, Structure of 'C' programming, Function as building block, Language fundamentals, Character set, Tokens, Keywords, Identifiers, Variables, Constant, Data types, Comments. Operators-types of operators, precedence and associativity, Expressions, Statement and types of statements, Console based I/O and related built-in I/O function: printf(), scanf(), getch(), getchar(), putchar ().	12
	2	**Introductions to Control Structures** Control structures: Conditional and loop, break, continue, goto, and exit, Concept of header files, Introduction to C preprocessor, Definition of preprocessor, Macro substitution directives, File inclusion directives.	10
	3	**Introduction to Arrays, Functions and Structures** Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing: call by value, and call by reference, Recursion, Storage classes. Definition, Declaration and initialization of 1-D arrays, Accessing, Displaying and sorting array elements. Arrays and functions, 2-D arrays, Declaration and initialization, Accessing and displaying, Memory representation of arrays: row major and column major, Multidimensional arrays, Definition and declaration of structures, Variables initialization, Accessing fields and structure operations, Nested structures, Union, Definition and declaration, Differentiate between union and structure.	13

	4	**Introduction to Pointers and Strings**	15
		Pointers, Definition and declaration, Initialization, Indirection operator, Address of operator, Pointer arithmetic, Dynamic memory allocation, Arrays and pointers, Function and pointers. Strings: definition, declaration and initialization of strings, Standard library functions: strlen(), strcpy(), strcat(), strcmp(), and their implementation without using standard library.	
	5	**Bitwise Operators and File Handling**	10
		Bitwise operators: shift operators, and bit field, File handling: definition of file, opening modes of files, binary file and text files, Standard function: fopen( ), fclose( ), feof( ), fseek( ), rewind( ), Using text files: fgetc( ), fputc( ), fprintf( ), fscanf( ), fread( ), fwrite(), Command line arguments.	
		Total Hours	**60**
TEXT BOOK	1.	Balagurusamy, E.; Programming in Ansi C; McGraw-Hill.	
	2.	Kanetkar, Y; Letus C; BPB Publication.	
REFERENCE BOOK/ SUGGESTED READING	1.	Ritchie, D. and Kernighan, B. W.; The C Programming Language; PHI.	
	2.	Dromey, R.G.; How to solve it by Computer; Pearson Education.	
	3.	Forouzan, B. A, Gilberg, R. F., Geetha, B.G, Singharavel, G: Computer Science: A Structured Programming Approach Using C; Cengage Learning.	

Course: DATA STRUCTURE USING C				Semester: II
Course Code: BCA 107	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	To impart appropriate knowledge of data structures and algorithms for solving real world problems, implement various kinds of searching and sorting techniques and implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.	
LEARNING OUTCOME	**After competing this course, you will be able to:** 1. Understand basic data structures such as arrays, strings, and linked lists. 2. Study linear data structures such as stacks and queues and understand their difference. 3. Describe the hash function and concepts of collision and its resolution methods. 4. Understand the concept of memory management. 5. Study tree, heap and graphs along with their basic operations.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction to Data Structure:** Definition, Classification of data structures (Linear and Non-Linear), Operations on data structures, Complexity: time and space complexity. String Processing: Strings, Storing strings, Fixed length structures, Variable length structures with fixed maximums and linked structures, Primitive operations on strings, Substring, Indexing, Concatenation and length of the string, Pattern matching.	12
	2	**Arrays and Sorting:** Definition, Representation of linear arrays in memory (Both Single and Two Dimensional arrays), Algorithm for insertion and deletion in one dimensional array (Ordered and Unordered arrays), advantages and disadvantages of arrays, Sparse matrices, Linear search and binary search. Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Shell sort, Counter sort.	12
	3	**Linked Lists:** Linked list, Representation of linked lists in memory, Operations on linked list (Insertion, Deletion, Display), Circular linked linear lists (Insertion, Deletion, Display), Doubly linked linear list (Insertion, Deletion, Display), Applications of linked linear lists.	12
	4	**Stacks and Queues:** Concepts, Operations, Sequential and linked implementation, Application of stacks, Towers of Hanoi, Infix, Prefix and	12

		Postfix expressions, and Evaluation of postfix expression using stacks. Concepts, Operations, Sequential and linked implementation, Linear queue (FIFO), Circular queues, Dequeue (Introductory concepts), Application of queues.	
	5	**Trees and Graph:** Binary trees, Complete binary trees, Binary search trees, Searching and inserting in binary search Trees, deletion in a binary search tree; Traversals on a binary tree (in-order, post-order, pre-order), Application of trees (brief overview).Basic terminology, Representations of graphs, Graph search methods: DFS and BFS	12
		Total Hours	**60**
TEXT BOOK	1. Lipschutz,; Data Structures; McGraw-Hill.		
REFERENCE BOOK/ SUGGESTED READING	1. Tremblay, J.P. and Sorenson, P.G.; An Introduction to Data Structures with Applications; McGraw-Hill. 2. Drozdek, A.; Data Structures and Algorithms in C++; Cengage Learning. 3. Sahni,S.; Data Structures, Algorithms and Applications in C++;Sillicon Press. 4. Langsam, Y; Augentein, M. J. and Tenenboum, A. M.; Data Structures using C and C++; Pearson.		

Course: OPERATING SYSTEMS WITH LINUX			Semester: II
Course Code: BCA 108	L T P	4 0 0	Credits: 4

OBJECTIVE	This course acquaints students with basic concepts of Operating System, its functions and services and providing hands on experience using Linux operating system and shell programming.
LEARNING OUTCOME	After competing this course, you will be able to: 1. Explain the structure and functions of operating systems along with their components, types and working. 2. Analyze the performance of different scheduling algorithms along with the policies for concurrency and deadlock management. 3. Elaborate the system calls for Memory Management and Device Management. 4. Elaborate the system calls for process management and file management. **5.** Make use of appropriate Linux commands for memory management, file management and directory management.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction** What is an operating system, Simple Batch Systems, Multi-programmed Batch systems, Time-Sharing systems, Personal – Computer systems, Parallel systems, Distributed systems, Real- Time systems.	10
	2	**Processes and Threads** Process Concept, Process Scheduling, Operation on Processes, CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple – Processor Scheduling. Process Synchronization: Background, The Critical – Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	15
	3	**Memory and Device Management** Basic memory management, Swapping, Virtual Memory, Page replacement algorithms, Implementation Issues, Segmentation. Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap- Space Management, Disk Reliability.	15

	4	**File Systems** Introduction, A Simple File system, Access Control Verification, Logical File System, Physical File system, File system Interface; File Concept, Access Methods, Directory Structure, Protection, Allocation Methods, Free- Space Management.	10
	5	**Linux** History of Linux, Linux Operating System Layers, The Linux Shell (different kinds of shell), Process: (parent and child processes), Memory management, Files and Directories (File Structure and directory structure), Shell Programming.	10
		Total Hours	**60**
TEXT BOOK	1. Silberschatz; A, Galvin, P. B and Gagne, G; Operating System Concepts, Wiley India. 2. Das, S.; UNIX Concepts and Applications, McGraw Hill		
REFERENCE BOOK/ SUGGESTED READING	1. Deitel H. M, Dietel, P. J and Choffens, T. R; Operating Systems, Pearson. 2. Madnick, S. E., Donovan J., Operating Systems; McGraw Hill. 3. Harris, A. J; Operating Systems; McGraw Hill. 4. Stones and Matthew; Beginning Linux Programming; Wrox. 5. Kanetkar; Unix Shell Programming; BPB publications.		

Course: **DISCRETE MATHEMATICS**			Semester: II
Course Code: BCA 109	**L T P**	**3 1 0**	**Credits: 4**

OBJECTIVE	To impart knowledge basic concepts of mathematical logic for analyzing propositions and proving theorems. Use sets for solving applied problems and use the properties of set operations algebraically. Work with relations and investigate their properties.
LEARNING OUTCOME	**After competing this course, you will be able to:** 1. Students can work with discrete structures, which are the abstract mathematical structures used to represent discrete objects and relationships between these objects. 2. Students will be able to understand mathematical reasoning to read, comprehend, and construct mathematical arguments which serves as the foundation for the subsequent discussions of methods of proof. 3. The learners will possess the ability to algebraic structures like groups. 4. Algorithmic Thinking: Certain classes of problems are solved by the specification of an algorithm. After an algorithm has been described, a computer program can be constructed to implement it. The learner will be able to perform the mathematical portions of this activity, which include the specification of the algorithm, the verification that it works properly, and the analysis of the computer memory and time required to perform it. **5.** Applications Boolean algebra to understand the basic working of computer components.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Sets and Relations:** Type and composition of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relations, Function types, Composition of function, Recursively defined functions.	12
	2	**Mathematical Induction:** Piano's axioms, Mathematical induction, Discrete numeric functions and generating functions, Simple recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic behavior of functions.	12
	3	**Algebraic Structures:** Properties, Semi group, Monoid group, Abelian group, Properties of groups, Subgroups, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.	15

	4	**Propositional Logic Lattices:** Proposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of proposition, Logical implication, Logical equivalence, Normal forms, Inference theory, Predicates and Quantifiers, Posets, Hasse diagram. Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.	15
	5	**Boolean Algebra:** Definition, Stone representation for finite Boolean algebra, Boolean function, Free Boolean Algebra, Relationship with statement logic.	06
		Total Hours	**60**
TEXT BOOK	1. Tremblay, J. P. and Manohar, R.; Discrete Mathematical Structures with Applications to Computer Science; McGraw-Hill		
REFERENCE BOOK/ SUGGESTED READING	1. Busby, R.; Kolman, B. and Ross, S.C; Discrete Mathematical Structures; Pearson 2. Sen, M. and Malik, D.S.; Discrete Mathematical Structures: Theory and Application; Cengage. 3. Johnson baugh, R.; Discrete Mathematics; Pearson. 4. Liu, C.L., Mohapatra, D. P.; Elements of Discrete Mathematics: A Computer Oriented Approach; McGraw-Hill.		

Course: COMPUTER ARCHITECTURE			Semester: II
Course Code: BCA 110	**L T P**	**3 1 0**	Credits: 4

OBJECTIVE	To impart knowledge about the basic concepts of Computer Architecture and various types of file systems and memory management.
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Study of the basic structure and operation of a digital computer system. 2. Understand basic Computer architecture and Assembly Language. 3. Understand the architecture and functionality of central processing unit. 4. Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations. 5. Understanding the hierarchical memory system, cache memories and virtual memory

COURSE DETAILS	Module No.	Topic	Hours
	1	**Register Transfer and Micro Operations:** Register Transfer Language, Register Transfer, Bus and memory transfer, Three-state bus buffer, Memory transfer, Arithmetic micro-operations, Binary incrementer, Logic micro-operations, Hardware Implementation, Shift micro-operations, Hardware implementation.	12
	2	**Basic Computer Organization and Assembly Language:** Instruction codes, stored programmed organization, Computer registers, Common bus system, Computer instructions, Instruction cycle, Register reference instructions, Memory reference instructions, Input-output and interrupt, Program interrupt, Interrupt cycle, Design of control logic, Control of common bus, Design of accumulator logic, Assembly language: Rules of the language, Assembler, Program, Loops, Assembly Programs on basic arithmetical and logical operations.	15
	3	**Central Processing Unit Organization:** Introduction, General register organization, Control word, Stack organization, Register stack, Memory stack, Reverse polish notation, Instruction formats, RISC instructions, Addressing modes, Data transfer and manipulation, RISC, Parallel processing, Pipelining, general considerations, Arithmetic pipeline, instruction pipeline.	11
	4	**Computer Arithmetic and Input-Output Organization:** Addition and subtraction, Addition and subtraction with signed-magnitude data, Hardware implementation,	10

		multiplication algorithms, Booth's multiplication algorithm, peripheral devices, Input-output interface, Asynchronous data transfer, modes of transfer, Priority interrupt, Daisy-chaining priority, Parallel priority interrupt, Direct memory access, DMA controller, Input-output processor, Serial communication.	
	5	**Memory Organization:** Memory hierarchy, Main memory, RAM and ROM chips, Memory address map, Memory interfacing with CPU, Auxiliary memory, Magnetic disk, Magnetic tapes, Associative memory, Hardware Organization of CAM, Cache memory, Cache organization, Locality of reference, Hit-miss ratio of cache, Virtual memory, Page replacement algorithms, Memory management hardware.	12
		Total Hours	**60**
TEXT BOOK	1. Morris M. M.; Computer System Architecture; Pearson Education		
REFERENCE BOOK/ SUGGESTED READING	1. Stallings, W.; Computer Organization and Architecture Designing for Performance; Pearson Education. 2. Hayes, J. P.; Computer Architecture and Organization; McGraw-Hill 3. Hamacher, C., Vranesic, Z. and Zaky S.; Computer Organization; McGraw-Hill.		

Course: ENGLISH COMMUNICATION-II				Semester: II
Course Code : BCA 111		L T P	1 0 2	Credits: 2

OBJECTIVE	The objective of the course is to develop among students a vast understanding of communication and its different dimensions.		
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Understand the concept of Personality. 2. Learn what personal grooming pertains 3. Learn to make good resume and prepare effectively for interview. 4. Learn to perform effectively in group discussions. 5. Explore communication beyond language. 6. Learn to manage oneself while communicating. 7. Acquire good communication skills and develop confidence.		
COURSE DETAILS	Module No.	Topic	Hours
	1	**Personality and Personal Grooming:** Understanding Personality, Definition and Meaning of Personality, Types of Personality, Components of Personality, Determinants of Personality, Assessment of Personality Grooming Self, Dress for success Make up & skincare, Hair care & styles for formal look, Art of accessorizing, Oral Hygiene.	07
	2	**Interview Preparation and Group Discussion:** Meaning and Types of Interviews [Face to Face, Telephonic, Video], Interview procedure [Opening, Listening, Closure], Preparation for Interview Resume Writing, LinkedIn Etiquette, Meaning and methods of Group Discussion, Procedure of Group Discussion, Group Discussion simulation, Group discussion common error.	08
	3	**Body Language and Behaviour :** Concept of human behavior, Individual and group behavior, Developing Self-Awareness, Behavior and body language, Dimensions of body language: Proxemics, Haptics Oculesics Paralanguage Kinesics, Sign Language Chromatics, Chronemics Olfactics, Cultural differences in Body Language, Business Etiquette & Body language, Body Language in the Post Corona Era, Virtual Meeting Etiquette, Social Media Etiquette.	09
	4	**Art of Good Communication :** Communication Process, Verbal and Non-verbal communication, 7 Cs of effective communication, Barriers to communication, Paralinguistics Pitch, Tone Volume Vocabulary Word stress Pause, Types of communication Assertive, Aggressive Passive, Listening Skills, Questioning Skills, Art of Small Talk, Email Writing.	06
		Total Hours	**30**

TEXT BOOK	1. Cloninger, S.C., "Theories of Personality: Understanding Person", Pearson, New York.
REFERENCE BOOK/ SUGGESTED READING	1. Luthans F, "Organizational Behaviour", McGraw Hill, New York. 2. Barron, R.A. & Brian D, "Social Psychology", Prentice Hall of India. 3. Adler R.B., Rodman G. & Hutchinson C.C., "Understanding Human Communication", Oxford University Press: New York.

Course: PROGRAMMING WITH C LAB			Semester: II
Course Code: BCA 106P	L T P	0 0 4	Credits: 2

OBJECTIVE	To develop practical skills and confidence in procedure-oriented programming using C

Suggested List of Practical's

Writing a program in C for :

1. Writing a program in C to find largest of three integers.
2. Writing a program in C to check whether the given string is palindrome or not.
3. Writing a program in C to find whether the given integer is a prime number and an Armstrong number.
4. Writing a program in C for Pascal triangle.
5. Writing a program in C to find sum and average of n integer using linear array.
6. Writing a program in C to perform addition, multiplication, transpose on matrices.
7. Writing a program in C to find Fibonacci series of iterative method using user-defined function.
8. Writing a program in C to find factorial of n by recursion using user-defined functions.
9. Writing a program in C to perform following operations by using user defined functions:
   a. Concatenation
   b. Reverse
   c. String-matching
10. Writing a program in C to find sum of n terms of series: n – n*2/2! + n*3/3! - n*4/4! + ...
11. Writing a program in C to interchange two values using
    a. Call by value.
    b. Call by reference.
12. Writing a program in C to display the mark sheet of a student using structure.
13. Writing a program in C to perform following operations on data files: Read from data file and Writing to data file.
14. Writing a program in C to copy the content of one file to another file using command line argument.
15. Writing a program in C to reverse a given number.
16. Writing a program in C to find gross salary.
17. Writing a program in C to find that entered year is leap year or not.
18. Writing a program in C to find whether given no is even or odd.
19. Writing a program in C to shift input data by two bits to the left.
20. Writing a program in C to perform linear sort on an array of integers.
21. Writing a program in C for reading an employee's file containing {emp_number, name, salary, address}. Create an output file containing the names of those employees along with their salary and address whose salary is > 20,000..

Course: DATA STRUCTURE USING C LAB			Semester: II
Course Code: BCA 107P	**L T P**	**0 04**	Credits: 2

OBJECTIVE	To impart practical knowledge about the use of data structures in computer science.

Suggested List of Practical's

Writing a program in C/C++ for

1.   Matrix Operations-Add, Multiply, Rank, Determinant.
2.   Stack and Queue operations using Arrays and linklist.
3.   Self-referential structures and single linked list operations.
4.   Implementing Stack and Queues using linked lists.
5.   Implementing Polish Notations using Stacks.
6.   Circular and double linked list operations.
7.   Implementing priority queue and Dequeue using lists.
8.   Evaluating polynomial operations using Linked lists.
9.   Implementing set related operations and Hashing.
10.   Linear search, binary search, and bubble sort techniques.
11.   Insertion sort, selection sort and merge sort techniques.
12.   Quick sort, counting sort and shell sort techniques.
13.   Binary tree traversals (preorder, in order, postorder).
14.   Storing sparse matrix as a linked list.
15.   Creating Binary Search tree.
16.   Illustrating application of recursion.
17.   Graph representation with matrix and adjacency lists.
18.   Creating a Hash Table that allows insertion, deletion and searching for an element.

Course: OPERATING SYSTEMS WITH LINUX LAB			Semester: II
Course Code: BCA 108P	**L T P**	**0 0 2**	Credits: 1

OBJECTIVE	To impart practical knowledge about the use of Linux operating systems

Suggested List of Practical's

1. Study of Basic commands of Linux.
2. Study of Advance commands and filters of Linux.
3. Write a shell script to generate mark sheet of a student. Take 3 subjects, calculate and display total
    Marks, percentage and Class obtained by the student.
4. Write a shell script to find factorial of given number n.
5. Write a shell script which will accept a number b and display first n prime numbers as output.
6. Write a shell script which will generate first n Fibonacci numbers like: 1, 1, 2, 3, 5, 13,…
7. Shell script Program to search whether element is present is in the list or not.
8.   Display calendar of current month and display today's date and time.
9. Display usernames those are currently logged in the system
10. Shell script program to check whether given file is a directory or not.
11. Write a shell script to display all executable files, directories and zero sized files from current Directory.
12. Shell script program to copy contents of one file to another.
13. Create directory, write contents on that and Copy to a suitable location in your home directory.
14. Use a pipeline and command substitution to set the length of a line in file to a variable
15. Write a shell script to check entered string is palindrome or not.
16. Shell programming using filters (including grep, egrep, fgrep).
17. Write a shell script program to display the process attributes.
18. Write a shell script to change the priority of processes.
19. Write a program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
20. Write a program to retrieve a process from background.
21. Write a shell script program to check variable attributes of file and processes.
22. Write a shell script program to check and list attributes of processes.
23. Shell Script program to implement read, write, and execute permissions.

SEMESTER-III

Course: RELATIONAL DATA BASE MANAGEMENT SYSTEMS			Semester: III	
Course Code: BCA 201	L T P	4 0 0	Credits:	4

OBJECTIVE	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.		
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Describe the fundamental elements of relational database management systems. 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. 3. Design ER-models to represent simple database application scenarios. 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data. 5. Improve the database design by normalization.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction:** Elements of database system, DBMS and it's architecture, advantages of DBMS, data independence, types of database users, role of database administrator	10
	2	**DBMS Architecture:** Brief overview of hierarchical and network model, relation model (Relations, properties of relational model, keys and entity integrity & referential integrity rules), CODD's rules for referential Model. Entity relationship Model: Entity sets, Relationship sets, Design Issue, Mapping constraints, E-R diagram, weak entity sets, specialization & generalization.	14
	3	**DBMS Designing Principles:** Normalization concepts and update anomalies, Functional dependencies, Normal forms (1NF, 2NF, 3NF, BCNF).	10
	4	**DBMS Language SQL :** SQL fundamentals - Integrity – Triggers - Security – Advanced SQL features – Embedded SQL–Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases.	14
	5	**DBMS Backup and Recovery:** Centralized system, Client-Server systems (Transaction server, Data server), Parallel system (Speedup & Scale up),	12

		Parallel database architecture (Shared memory, Shared Disk, Shared Nothing), Distributed System (Structures, Tradeoffs), Backup and Recovery, Security and Privacy.	
		Total Hours	**60**
TEXT BOOK		1. Silberschatz & Korth, Database system Concepts, TMH 2. Navathe E, "Database Management Systems", TMH	
REFERENCE BOOK/ SUGGESTED READING		1. Bipin Desai, An Introduction to Database System, Galgotia Publication 2. Date C J, "An Introduction to Database System", Addison Wesley 3. Ivan, Bayross; SQL/ PL SQL Programming Language of Oracle; BPB Publication Forth Edition.	

Course: PROGRAMMING WITH JAVA			Semester: III
Course Code: BCA 202	**L T P**	**4 0 0**	Credits: 4

OBJECTIVE	To introduce the object-oriented programming concepts and apply them in solving problems and translates the concepts to design Graphical User Interface using applets and swing controls.			
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Able to solve real world problems using OOP techniques. 2. Able to understand the use of abstract classes. 3. Able to solve problems using java collection framework and I/o classes. 4. Able to develop multithreaded applications with synchronization. 5. Able to develop applets for web applications and design GUI based applications.			
COURSE DETAILS	**Module No.**	**Topic**		**Hours**
	1	**Object-Oriented Thinking-** A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling. Inheritance–Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.		12
	2	**Stream based I/O Packages-** Defining a Package, CLASSPATH, Access protection, importing packages. Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces. Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.		12
	3	**Exception handling** – Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw,		12

		throws and finally, built- in exceptions, creating own exception sub classes. Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.	
	4	**The Collections Framework** Collections overview, Collection Interfaces, The Collection classes Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner	12
	5	**GUI Programming with Swing** Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout. Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes. A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.	12
		Total Hours	**60**
TEXT BOOK		1. Herbert Schildt,;Java The complete reference, McGraw Hill Education (India) Pvt. Ltd. 2. T. Budd; Understanding Object-Oriented Programming with Java, Pearson Education.	
REFERENCE BOOK/ SUGGESTED READING		1. J. Nino and F.A. Hosch; An Introduction to programming and OO design using Java, John Wiley & sons 2. Y. Daniel Liang; Introduction to Java programming, Pearson Education. 3. P. Radha Krishna; Object Oriented Programming through Java, University Press. 4. S. Malhotra, S. Chudhary; Programming in Java, 2nd edition, Oxford Univ. Press. 5. R. A. Johnson; Java Programming and Object-oriented Application Development, Cengage Learning	

Course: COMPUTER BASED NUMERICAL METHODS				Semester: III
Course Code: BCA 203	**L T P**		**3 0 0**	Credits: 3

OBJECTIVE	Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis and gain experience in the implementation of numerical methods using a computer and Trace error in these methods and need to analyse and predict it.		
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions. 2. Analyze statistical data using measures of central tendency, dispersion, and location. 3. Calculate and interpret the correlation between two variables. 4. Employee the principles of linear regression and correlation, including least square method, predicting a particular value of Y for a given value of X and significance of the correlation coefficient. 5. Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Computer Arithmetic and Errors:** Number System, Conversion of Numbers, Representation of numbers, Floating point representation, Arithmetic operations with Normalized Floating-point Numbers, consequences of normalization, pitfalls in computing. Approximation and Errors Significant digits, Types of errors, absolute and relative error.	08
	2	**Roots of Nonlinear Equations:** Introduction, Methods of Solution, Iterative Methods, Bisection method, False position method, Netwon-Raphson method, Secant method, Rate of convergence of iterative methods.	10
	3	**Solution of simultaneous algebraic Equations:** Gauss elimination method, Pivoting, ill-conditioned systems, Gauss-Seidel iterative method, Convergence of Iteration methods.	10
	4	**Polynomial Interpolation:** Introduction, Polynomial Forms, Linear interpolation, Lagrange interpolation, Newton interpolation, Difference table, Forward and backward difference table.	10

	5	**Numerical Integration :** Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule.	07
		Total Hours	**45**
TEXT BOOK	1.	Balagurusamy, E., Numerical Methods, Tata McGraw Hill, 1999.	
	2.	Rajaraman V., Computer Oriented Numerical Methods, 3rd Edition, Prentice Hall India, New Delhi, 1998.	
REFERENCE BOOK/ SUGGESTED READING	1.	Stoor, Bullrich, Computer Oriented Numericals Methods, Springer-Verlag.	
	2.	Krishnamurthy, E.V., Sen, S.K., Computer Based Numerical Algorihms, East West Press.	
	3.	Jain, M.K., Iyengar, S.R.K., Jain R.K., Numerical Methods : Problems and Solutions, New Age Int.(P) Ltd., New Delhi.	
	4.	Jain, M.K., Iyengar, S.R.K., Jain R.J., Numerical Method	

Course: SOFTWARE ENGINEERING				Semester: III
Course Code: BCA 204	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases and provide an idea of using various process models in the software industry according to given circumstances.
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Familiarize Software and Software Engineering. 2. Evaluate the Software Requirement Analysis. 3. Design about the Structured Analysis. 4. Identify Software Design. 5. Appropriate about the Software Testing methods.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction:** The Evolving Role of Software, Software characteristics, Software Engineering as a Layered Technology, Software Process Framework and Umbrella Activities, Process Models.	12
	2	**Requirement Analysis:** Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modelling Techniques, Flow Oriented Modelling, Need for SRS, Characteristics and Components of SRS.	12
	3	**Software Project Management:** Estimation in Project Planning Process, Project Scheduling. Risk Management: Software Risks, Risk Identification, Risk Projection and Risk Refinement.	12
	4	**Software Engineering Principles &Tools:** Tools of Design (Data Flow Diagrams, Data Dictionary, Decision Tree, Decision Tables), Modularization (Coupling).	12
	5	**Testing Strategies & Tactics:** Software Testing Fundamentals, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.	12
		Total Hours	**60**
TEXT BOOK	1. R.F.Fairley, "Software Engineering Concepts", McGraw Hill. 2. R.S.Press Man, "Software Engineering A Practitioners Approach" McGraw Hill.		

REFERENCE BOOK/ SUGGESTED READING	1. Rajib Mall, "Fundamentals of Software Engineering". PHI. 2. Pankaj Jalote. "An Integrated Approach to Software Engineering", Narosa

Course: DATA COMMUINICATION AND NETWORKING			Semester: III
Course Code: BCA 205	**L T P**	**4 0 0**	Credits: 4

OBJECTIVE	To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases and provide an idea of using various process models in the software industry according to given circumstances.		
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Remember the fundamentals of Networking. 2. Understand Networking Models. 3. Evaluate various Transmission Mediums. 4. Analyze Technologies and Protocols and switching techniques. 5. Analyse the functions of Network Layers of OSI Models		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Network definition:** Network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.	12
	2	**Data Communication Fundamentals and Techniques:** Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; digital to analog modulation- multiplexing techniques- FDM, TDM; transmission media.	12
	3	**Error detection techniques:** Data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Multiple Access Protocol.	12
	4	**Networks Switching Techniques and Access mechanisms:** Circuit switching; packet switching-connectionless datagram switching, connection-oriented virtual circuit switching.	12
	5	**Networks Layer Functions and Protocols:** Routing algorithms; Distance vector routing and link state routing, protocol of Internet- IP protocol (IP4)	12
		Total Hours	**60**
TEXT BOOK	1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM. 2. S. Tanenbaum: Computer Networks, PHI.		

REFERENCE BOOK/ SUGGESTED READING	1. James F. Kurose, Keith W. Ross, "Computer Networking", Pearson Education.
	2. Michael A. Gallo, William M. Hancock, "Computer Communications and Networking Technologies", CENGAGE Learning

Course: RELATIONAL DATA BASE MANAGEMENT SYSTEMS LAB			Semester: III
Course Code: BCA 201P	L T P	0 0 4	Credits: 2

OBJECTIVE	Create, Maintain and Query MySQL Database and by Using MySQL to model real world data.

Lab Experiment List

1. Analyze the organization and identify the entities, attributes and relationships in it.
2. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.
3. Relate the entities appropriately. Apply cardinalities for each relationship.
4. Identify strong entities and weak entities (if any).
5. Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion.
6. Apply the First, Second and Third Normalization levels on the database designed for the organization.
7. Installation of Mysql and practicing DDL commands
8. Installation of MySql. Creating databases, how to create tables, altering the database, dropping.
9. tables and databases if not required. Try truncate, rename commands etc.
10. Practicing DML commands on the Database created for the example organization.
11. DML commands are used to for managing data within schema objects. Some examples: SELECT, INSERT, UPDATE, DELETE
12. Practice queries (along with sub queries) involving ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.
13. Practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

Course: PROGRAMMING WITH JAVA LAB			Semester: III
Course Code: BCA 202P	L T P	0 0 4	Credits: 2

OBJECTIVE	Use JAVA programming language to implement OOPs concepts and create GUI applications that mimic real world scenarios.

Lab Experiment List
1. Program on strings.
2. Programs to practice loops.
3. Program to demonstrate all math class functions.
4. Program on files.
5. Program to demonstrate method over-riding and overloading.
6. Programs on Inheritances.
7. Program to create a Date object using the Calendar class.
8. Program to add some hours to the current time.
9. Multi-threaded programming.
10. Programs to demonstrate the use of container classes of JAVA.
11. Programs to demonstrate Database Programming.
12. Programs to queries MySQL database through JAVA.
13. Creating and using Packages.
14. Creating GUI applications using Java Swing.
15. Creating Applications that uses GUI concepts as well as Database Programming Concepts.
16. Create Clone of popular real-life windows Application using Swing and JDBC.

Course: COMPUTER BASED NUMERICAL METHODS LAB			Semester: III
Course Code: BCA 203P	L T P	0 0 2	Credits: 1

OBJECTIVE	Develop the skill to formulate the numerical methods and concepts in computer programs using any programming language like C or C++

Lab Experiment List:
1. To find the roots of non-linear equation using Bisection method.
2. To find the errors.
3. To find the roots of non-linear equation using Regula-False method.
4. To find the roots of non-linear equation using newton's forward method.
5. To find the roots of non-linear equation using newton's backward method
6. To find the roots of non-linear equation using sterling's method
7. Curve fitting by least – square approximations.
8. To solve the system of linear equations using gauss - elimination method.
9. To solve the system of linear equations using gauss - Seidel iteration method.
10. To solve the system of linear equations using gauss - Jordan method.
11. To integrate numerically using trapezoidal rule.
12. To integrate numerically using Simpson's 1/3 rules.
13. To integrate numerically using Simpson's 3/8 rules.

Course: BUSINESS COMMUNICATION AND ETIQUETTEE LAB			Semester: III	
Course Code: BCA 206 P	L T P	0 0 4	Credits: 2	

OBJECTIVE	To familiarize students with soft skills like Communication Skills, People Skills, etc and personality traits to enhance their interactions, job performance and career prospects.		
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Apply the conceptual understanding of communication into everyday practice. 2. Understand the importance of teamwork and group discussion skills. 3. Make use of techniques for self-awareness and self-development. 4. Develop insights on how to cope up with work stress and students will develop time management skills. 5. Apply business etiquette skills on professional front and will bring a change in organizational culture		
COURSE DETAILS	Module No.	Topic	Hours
	1	**Communication Skills:** Basics of Communication Skills—Verbal Communication, Nonverbal Communication-Kinesics, Paralanguage and Proxemics. Presentation Skills - Multimedia Presentation: Understanding the Basics, Features, Structure, Aids and Importance, Presentation and Interaction. Public Speaking- Art of Public Speaking, the Rhetoric of making a Public Speech, Exploring Rhetorical Elements through various Videos.	05
	2	**Interpersonal Communication:** Building Relationships - Understanding Group Dynamics, Conflicts and their Resolution, Social Network, Media and Extending our Identities. Role of Personality and its various Attributes - Emotional Quotient, Attitude, Perception, Motivation, Socialization, Self- Esteem, Impact of Behavior, and Self-Awareness. Stress Management and Accepting Criticism in determining Efficacy of Interpersonal Communication	061
	3	**Professional Skills:** Creativity, Critical Thinking and Problem Solving. Leadership Skills- Develop Leadership Qualities. Collaboration and Team Work - Work Effectively in a Team, understand Personal as well as Professional Goals of the members of the Group. Decision Making- Creative, Rational and Intuitive Decision Making. Negotiation - Ways of Effective Negotiation. Mentoring and Conflict Management–Reasons of Conflicts in Human	06

		Relations, Approaches to Conflict Resolution, Importance and Manner of Mentoring. Conducting Meetings - Call and Organize meetings, Conducting meetings, Agenda and Minutes of the meeting. Time Management and Effective Planning - Importance of Time, Preparing Time Line, Allocation of time, Prioritizing Work, Multi-Tasking. Stress Management - Kinds of Stress, Reason/s of Stress, Techniques to cope with Stress.	
	4	**Business Etiquette:** Professional Grooming- How to carry yourself; Dressing- Selection of Proper Attire as per the Situation, and Conduct- To Project One's Self in the Right Frame and Spirit. Work-Life Balance and Punctuality.	07
	5	**Social Etiquette-** Meeting People, Greetings, Introductions, Office Parties, Dining Etiquette, Cultural Courtesy. Professional Etiquette - Phone Etiquette - Tone and Pitch of the Voice, Voice Mail, Correspondence Etiquette, Netiquettes	06
		Total Hours	**30**
TEXT BOOK	1. Nitin Bhatnagar; *Effective Communication and Soft Skills*; Pearson Education India		
REFERENCE BOOK/ SUGGESTED READING	1. Daniel Coleman; *Emotional Intelligence*; Bantam Book, 2. Butterfield Jeff; *Soft Skills for Everyone*; Cengage Learning,		

SEMESTER-IV

Course: WEB TECHNOLOGIES				Semester: IV	
Course Code: BCA 207	**L T P**		**4 0 0**	Credits:	4

OBJECTIVE	To introduce the fundamentals of Internet, and the principles of web design languages and develop modern interactive web applications using PHP, XML and MySQL.
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Understand best technologies for solving web client/server problems. 2. Analyze and design real time web applications. 3. Use Java script for dynamic effects and to validate form input entry. 4. Analyze to Use appropriate client-side and Server-side application technology. 5. Able to develop web applications using PHP with database connectivity.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to HTML:** Basics of HTML, formatting, and fonts, commenting code, hyperlink, lists, tables, images, forms, Meta tags, Character entities, frames and frame sets, Overview and features of HTML5.	10
	2	**Style Sheets:** Need for CSS, Introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3	12
	3	**Introduction to JavaScript:** JavaScript Variables and Data Types, Declaring Variables, Data Types, Statements and Operators, Control Structures, Conditional Statements, Loop Statements, Object-Based Programming, Functions, Executing Deferred Scripts, Objects, Message box in JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array.	14
	4	**PHP:** Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP.	12

	5	**PHP Database Connectivity:** Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs.	12
		Total Hours	**60**
TEXT BOOK	1.	Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Prentice Hall	
	2.	Douglas Crockford; JavaScript: The Good Parts; O'Reilly Yahoo Press	
REFERENCE BOOK/ SUGGESTED READING	1.	Jeremy Keith p; HTML5 for Web Designers; A Book Apart Jeffrey Zeldmann.	
	2.	Cameron Adams; The Art and Science of CSS: Create Inspirational, Standards-Based Web Designs	
	3.	Lynn Beighley & Michael Morrison; Headfirst PHP & MySQL; O'Reilly Media, Inc.	

Course: COMPUTER GRAPHICS				Semester: IV
Course Code: BCA 208	**L T P**		**3 0 0**	Credits: 3

OBJECTIVE	The course is to introduce students with fundamental concepts and theory of computer graphics. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.	
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics. 2. Understand various algorithms for scan conversion and filling of basic objects and their comparative analysis. 3. Understand the use of geometric transformations on graphics objects and their application in composite form. 4. Understand how to Extract scene with different clipping methods and its transformation to graphics display device. 5. Explore projections techniques for display of 3D scene on 2D screen.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction:** Basic elements of Computer graphics, Applications of Computer Graphics. Graphics Hardware, Video Display Devices, Architecture of Raster and Random scan display devices, Input devices, Hard-copy devices, Graphics software.	10
	2	**Fundamental Techniques in Graphics:** Line Drawing Algorithms: DDA Algorithm, Bresenham's Line algorithm, Circle Generating Algorithms: Midpoint Circle Algorithm. Filled-Area Primitives: Scan-line polygon fill algorithm, InsideOutside Tests, boundary Fill Algorithm, Flood-Fill algorithm.	10
	3	**Two- Dimensional Geometric Transformations:** Basic Transformations Translation, Rotation, Scaling. Matrix representations and Homogeneous Coordinates, Composite Transformations. Other Transformations: Reflection, Shearing.	10
	4	**Two-Dimensional Viewing:** The Viewing Pipeline, Clipping operations: Point clipping, Line Clipping: Cohen Sutherland line clipping, Liang- Barsky line clipping, Nicholl-lee- Nicholl line clipping, Polygon Clipping: Sutherland Hedgeman Polygon Clipping, Weiler-Atherton Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.	10

	5	**Three-Dimensional Concepts and 3-D Transformations:** 3-D display methods: Parallel projection, Perspective projection. Basic Transformations- Translation, Rotation, Scaling.	05
		Total Hours	**45**
TEXT BOOK		1. J.D.Foley, A.Van Dan, Feiner, Hughes; Computer Graphics Principles & Practice ;Wesley. 2. D.Hearn, Baker; Computer Graphics, Prentice Hall of India.	
REFERENCE BOOK/ SUGGESTED READING		1. Lehn Karsten; Introduction to Computer Graphics; Springer. 2. Steve Marschner Peter Shirley, A K Peters; Fundamentals of Computer Graphics; A K Peters/Crc Pres. 3. S. Bhattacharya; Computer Graphics; Oxford Press	

Course: PYTHON PROGRAMMING			Semester: IV	
Course Code: BCA 209	L T P	3 0 0	Credits: 3	

OBJECTIVE	The course is designed to provide Basic knowledge of Python, Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Remember the basic principles of Python programming language. 2. Implement object-oriented concepts in Python. 3. Analyze Functional Programming Paradigm with Python. 4. Use the concepts of classes and object to develop an applications 5. Create tools for web scrapping.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction and Overview:** Overview of Python Programming: Structure of a Python Program, Elements of Python, Python Interpreter, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings.	08
	2	**Operators and Statements:** Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). Creating Python Programs: Input and Output Statements.	08
	3	**Decision making and Branching:** Control statements (Branching, Looping, Conditional Statement, Difference between break, continue and pass, default arguments. Defining Functions.	10
	4	**Classes and Objects:** An introduction to object-oriented programming in Python. objects, operator overloading, overriding, special methods. Inheritance, polymorphism and composition.	10
	5	**Iterators and Generators:** Iteration protocol, Iterable objects, generators and generator expressions. Use of generators, assertions. Testing and debugging of a python project, Web Scrapping in Python.	09
		Total Hours	**45**
TEXT BOOK	1. T. Budd, Exploring Python, TMH. 2. Python Tutorial/Documentation www.python.	

REFERENCE BOOK/ SUGGESTED READING	1. Allen Downey, Jeffrey Elkner, Chris Meyers, how to think like a computer scientist: learning with Python. (online)
	2. Brown C. M.; Python: The Complete Reference; Tata McGrahill.
	3. Adams, A.; Python Programming for Beginners: A Comprehensive Crash Course With Practical Exercises to Quickly Learn Coding and Programming for Data Analysis and Machine Learning

Course: E-COMMERCE			Semester: IV
Course Code: BCA 210	**L T P**	**4 0 0**	Credits: 4

OBJECTIVE	This course introduces information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems.		
LEARNING OUTCOME	**After completing this course, students will be able to:** 1. Understand the basic concepts and technologies used in the field of Information Systems, specifically E-Commerce eco system. 2. Have knowledge of the different types of management information systems and methods of e-commerce. 3. Understand the processes of developing and implementing information systems. 4. Be aware of the ethical, social, and security issues of internet security system 5. Understand the different applications of Internet for E-Commerce.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Electronic Commerce Environment and Opportunities:** Background, The Electronic Commerce Environment, Electronic Marketplace Technologies. Modes of Electronic Commerce: Electronic Data Interchange, Migration to Open EDI, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward.	12
	2	**Approaches to Safe Electronic Commerce:** Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks. Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash.	12
	3	**Internet/Intranet Security Issues and Solutions:** The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.	12
	4	**Master Card/Visa Secure Electronic Transaction:** Introduction, Business Requirements, Concepts, payment Processing. E-Mail and Secure Email Technologies for Electronic Commerce: Introduction, The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object	12

		Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.	
	5	**Internet Resources for Commerce:** Introduction, Technologies for web Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet. Advertising on Internet: Issues and Technologies. Introduction, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.	12
		Total Hours	**60**
TEXT BOOK		1. Laudon. K.C, Traver C. G.; E-Commerce 2021- 2022 Business, Technology, and Society; Pearson 2. Galgotia; Frontiers of Electronic Commerce; TMH	
REFERENCE BOOK/ SUGGESTED READING		1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, E-Commerce Fundamentals and Applications; John Wiley. 2. Daniel Minoli, Emma Minoli; Web Commerce Technology Handbook; McGraw-Hill 3. Henry Chan and Raymond Lee and Tharam Dillon and Elizabeth Chang; E-Commerce, Fundamentals and Applications; John Wiley	

Course: ORGANIZATIONAL BEHAVIOUR				Semester: IV
Course Code: BCA 211	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	To familiarize the students with basic concepts, theories and techniques in the field of human behavior at individual, group and organizational levels.
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Define basic organizational behavior principles and analyze how these influence behavior in the workplace. 2. Analyze individual human behavior in the workplace as influenced by personality, values, perceptions, and motivations. 3. Outline the elements of group behavior including group dynamics, communication, leadership, power & politics, and conflict & negotiation. 4. Understand their personal management style as it relates to influencing and managing behavior in the organization systems. 5. Enhance their critical thinking and analysis skills through the use of management case studies, personal application papers and small group exercises.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction:** Concept of Organizational Behaviour, scope, evolution, conceptual models, challenges and opportunities, interdisciplinary role of Organizational Behaviour.	10
	2	**Foundation of Individual Behaviour**: Learning: Theories, Learning curve; Attitude: components, change of attitude; Job satisfaction: meaning, factors affecting job satisfaction. Concept of personality and its types: Big Five Model, MBTI, Perception: process, perceptual errors, Attribution theory.	15
	3	**Concept of Group Dynamics:** Concept and features of group, Types of groups: Formal and informal groups, Process of group formation, Group decision making; Work Teams; Conflict: types of conflict, causes and resolution of conflict.	15
	4	**Leadership:** Concept, styles and behaviours, Theories of leadership: Trait theories; Behavioural theories (Ohio and Michigan studies); Contingency and situational theories, Power and Authority.	12

	5	**Stress Management:** Concepts of stress, sources, consequences and techniques for management of stress.	08
		Total Hours	**60**
TEXT BOOK	1. Robbins, S. P., Judge, T.A. and Vohra, N.; *Organizational Behavior*; Pearson Education		
REFERENCE BOOK/ SUGGESTED READING	1. Luthans, F.; *Organizational Behavior;* McGraw Hill 2. Pareek, U.; Understanding Organizational Behavior; Oxford University Press 3. Newstorm, J.; *Human Behavior at Work;* McGraw Hill 4. McShane, S.L. and Mary, V.G. and Sharma, R.R.; Organizational Behavior; McGraw Hill 5. Singh, K.; Organization Behavior: Text and Cases; Pearson Education		

Course: PERSONALITY DEVELOPMENT AND SOFT SKILLS			Semester: IV
Course Code: BCA 212	**L T P**	**1 0 2**	Credits: 2

OBJECTIVE	To develop students' calibre for effective speaking and writing with professional perspectives.		
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Recapitulate the fundamentals of English grammar and writing. 2. Develop the art of effective articulation in professional set ups. 3. Understand their strengths to capitalise on, and weaknesses to overcome. 4. Create research articles and reports pertaining to academic dissertation and future projects.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Professional Communications - Fundamentals** ● Tenses and sentence-structures: A recapitulation ● Verbal and non-verbal communication ● Decoding body language and facial expressions ● Syntax formation using all principles of communication.	09
	2	**Effective Speaking** ● Speech writing and delivery ● Aided and unaided presentations ● Impromptu speaking	07
	3	**Personality Embellishment** Self-assessment using SWOC, improving emotional quotient, leadership development, chronemic efficacy, and coping with stress	07
	4	**Business Writing Skills** ● Business correspondences v/s general writings ● Principles, kinds and orders of Paragraph-writing ● Drafting business proposal; elements of research writing and report formation	07
		Total Hours	**30**
TEXT BOOK	1. Bovee, Courtland and Thrill, John; *Business Communication Essentials - A Skills-based Approach to Vital Business*; Prentice Hall		
REFERENCE BOOK/ SUGGESTED READING	1. Butterfied, Jeff; *Soft Skills for Everyone*; Cengage		

Course: WEB TECHNOLOGIES LAB			Semester: IV	
Course Code: BCA 207P	**L T P**	**0 0 4**	Credits: 2	

OBJECTIVE	Create various dynamic Web bases application software's using web technological tools like HTML, CSS and PHP and MySQL.

Lab Experiment List
1. Calculate Hypotenuse of triangle using dynamic initialization of variables
2. Develop a PHP application to print the students list using classes and objects.
3. Develop a PHP application to implement inheritance concepts Single Inheritance, Multilevel Inheritance, Multiple Inheritance.
4. Develop a console application to implement operator overloading concept in PHP Unary Operator Overloading, Binary Operator Overloading
5. Develop a PHP application to implement multithreading.
6. Develop a PHP console application to implement the following concepts: Delegates, Events
7. Design a window-based application using PHP.
8. Design windows-based messenger application.
9. Learn HTML fundamentals.
10. Create Webpages with HTML, CSS.
11. Practice JavaScript.
12. Develop Web Application for capturing data with input validation.
13. Create dynamic Webpages.
14. Create a real life website.

Course: COMPUTER GRAPHICS LAB				Semester: IV
Course Code: BCA 208P	L T P		0 0 4	Credits: 2

OBJECTIVE	Apply the fundamental concepts and theory of computer graphics by computer programs using any computer language preferably C++

Lab Experiment List:

1. To Study various in build graphics functions in C library.
2. Write a program to draw a line using DDA algorithm.
3. Write a program to draw a line using Bradenham's algorithm.
4. Write a program to draw a circle using midpoint algorithm.
5. Write a program to draw a circle using Bradenham's algorithm.
6. Write a program to draw a rectangle using line drawing algorithm.
7. Write a program to perform 2D Transformation on a line.
8. Write a program to perform shear transformation on a rectangle.
9. Write a program to rotate a circle (alternatively inside and outside) around the circumference of another circle.
10. Write a program to draw a car using in build graphics function and translate it from bottom left corner to right bottom corner of screen.
11. Write a program to draw balloons using in build graphics function and translate it from bottom left corner to right top corner of screen.
12. Write a program to draw a cube using in build library function and perform 3D transformations.
    a. Translations in x, y, z directions
    b. Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession.
    c. Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of 3.
13. Write a program to implement line clipping (Cohen Sutherland algorithm). 13. Write a program for making Bezier curves.
14. Write a program to study various in build functions for 2D drawing in MAYA software.
15. Write a program to show animation of a ball moving in a helical path.
16. Write a program to show animation of solar system.

Course: PYTHON PROGRAMMING LAB				Semester: IV
Course Code: BCA 209P	L T P		0 0 4	Credits: 2

OBJECTIVE	Apply the Python programming concepts in computer lab and develop the skills to visualize the data and web applications.

Lab Experiment List

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a programs to perform different String Operations.
4. Write programs to showcase the python time library.
5. Write a program to demonstrate working with lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write programs to demonstrate the uses of functions.
9. Demonstrate the use of *args, **kwargs in python.
10. Write Programs to showcase use of lambda functions.
11. Write a python program to define a module and import a specific function in that module to another program.
12. Write Programs for file operations in python.
13. Write programs to demonstrated the working of generator.
14. Implement programs to showcase the uses of Iterators.
15. Demonstrate OOPs Capabilities of python language.
16. Demonstrate Exception Handling features of Python.
17. Write testing cases for python programs.
18. Learn basics of web scrapping in python.
19. Create a working web scrapper in python.

SEMESTER-V

Course: Artificial Intelligence				Semester: V
Course Code: BCA 301	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	To enable the students to understand the basic principles of Artificial Intelligence and its various applications.	
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Understand the basics of Artificial Intelligence and gain knowledge of the learning process and its models. 2. Understand different types of search techniques. 3. Understand different knowledge representation schemes. 4. Understand the AI applications in the design of expert systems. 5. Understand basic concepts of machine learning, ANN, SVM and fuzzy logic	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction:** Introduction to Artificial Intelligence, Background and Applications, AI techniques, Tic Tac-Toe problem, Problem Characteristics.	10
	2	**Problem Solving and Searching Techniques:** Problem Characteristics, Production Systems, Water Jug Problem, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search. 8-Puzzle Problem	15
	3	**Knowledge Representation:** Definition of Knowledge, Knowledge Based Systems, Representation of Knowledge. Introduction to First Order Predicate Logic, Conversion to clausal form, Unification, Resolution Principle	12
	4	**Expert Systems:** Introduction to Expert Systems, Characteristic Features of Expert Systems, Applications of Expert Systems, Components and Working of Expert Systems	8
	5	**Introduction to Machine Learning Techniques:** Fuzzy Logic, Fuzzy Set, Membership Function, Union, intersection and complement of a fuzzy set, Introduction to Artificial Neural Network, Introduction to Support Vector Machine.	15
		Total Hours	**60**

TEXT BOOKS:	1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI,
	2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall.
REFERENCE BOOK/ SUGGESTED READING	1. Rich & Knight, Artificial Intelligence – Tata McGraw Hill.
	2. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House.

Course: Fundamentals of Accounting			Semester: V	
Course Code: BCA 302	**L T P**	**2 0 0**	**Credits: 2**	

OBJECTIVE	To familiarize students with the mechanics of preparation of financial statements, understanding corporate financial statements, their analysis and interpretation.	
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Define bookkeeping and accounting. 2. Understand the accounting process. 3. Describe the main elements of financial accounting information, assets, liabilities, revenue and expenses, along with subsidiary books. 4. Understand the preparation of financial statements, Trading Account, Profit & Loss Account and Balance Sheet 5. Explain various Indian accounting standards, IFRS and preparation of depreciation accounting.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1.	**Introduction to Accounting:** Introduction to Basic Financial Accounting. Accounting as an Information System. Importance, Scope, and Limitations. Users of Accounting Information. Generally Accepted Accounting Principles.	05
	2.	**Basics of Accounting:** The Accounting Equation. Nature of Accounts and Rules of Debit and Credit. Recording Transactions in General Journal. Recording Transactions in Three Column Cash Book. An Overview of Subsidiary books – Purchase Book, Purchase Returns Book, Sales Book, and Sales Returns Book. Opening and Closing Entries. Preparation of Ledger Accounts	08
	3.	**Preparation of Financial Statements:** Preparation of Financial Statements: Preparing Trading Account, Profit and Loss Account and Balance Sheet for a Sole Proprietor.	07
	4.	**Financial Statements:** Understanding contents of Financial Statements of a Joint Stock Company as per Companies Act 2013.Preparation of Cash Flow Statement as per AS-3 (revised). Understanding the Contents of a Corporate Annual Report	05
	5.	**Accounting Standards (AS):** Indian Accounting Standards: Concept, Benefits, Procedure for Issuing Indian Accounting Standard in India, Salient Features of Indian AS issued by ICAI. International Financial Reporting Standards (IFRS): Features, Uses and Objective of IFRS, IFRS Issued by IASB and Concept of Harmonisation and Convergence, Obstacle in Convergence	05
		Total Hours	**30**

TEXT BOOK	1. Anthony R. N., Hawkins D. F., and Merchant K. A.; *Accounting Text and Cases*; McGraw Gill.
REFERENCE BOOK/ SUGGESTED READING	1. Maheshwari, S.N. and Maheshwari, S. K.; *Financial Accounting*; Sultan Chand and Sons 2. Grewal T. S.; *Double Entry Book Keeping*; Sultan Chand and Sons 3. Gupta, R.L.; *Advanced Accounting*; Sultan Chand and Sons 4. Bhattacharya, A.; *Essentials of Financial Accounting*; Pearson Education 5. J. R. Monga; *Financial Accounting*: Concepts and Applications; Mayur Paperbacks

Course: Business Intelligence				Semester: V
Course Code: BCA 303	**L T P**		**3 0 2**	**Credits: 4**

OBJECTIVE	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems.		
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Understand concepts and components of Business Intelligence (BI). 2. Evaluate the technologies that make up BI (data warehousing, OLAP). 3. Understand how BI will help an organization. 4. Identify the technological architecture that makes up BI systems. Plan the implementation of a BI system. 5. Understanding of data visualization.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	Introduction to Business Intelligence (BI), Definition and scope of Business Intelligence, Components and architecture of BI systems, Data warehousing and data integration.	10
	2	Data Analysis and Reporting Data visualization techniques, Reporting tools and dashboards, Online Analytical Processing (OLAP).	15
	3	Data Mining and Predictive Analytics Data mining techniques and algorithms, Predictive modeling and forecasting, Pattern recognition and association rules.	15
	4	Business Performance Management Key Performance Indicators (KPIs), Balanced Scorecard approach, Performance monitoring and benchmarking	12
	5	**Data Visualization** Objective, choose effective chart, features of charts, Area Charts; Column charts, Line charts, Pie charts, Point Chart, customize chart options.	08
		Total Hours	**60**
TEXTBOOKS:	1. Gautam, Sangeeta, IBM Cognos; Business Intelligence; IBM Press		
REFERENCE BOOK/ SUGGESTED READING	1. Wilfried, Grossmann, Rinderle-Ma, Stefanie; Fundamentals of Business Intelligence; Springer. 2. Loshin, David; Business Intelligence; Elsevier. 3. Volitich, Dan, Ruppert, Gerard; IBM Cognos; Business Intelligence 10: The Official Guide; McGraw-Hill. 4. Turban, E, Sharda, R, Delen, Dursun, and King, David; Business Intelligence: A Managerial Approach; Pearson.		

Course: Artificial Intelligence Lab				Semester: V
Course Code: BCA 301P	**L T P**	**0 0 2**		Credits: 1

S.NO	LIST OF SUGGESTED PRACTICAL/EXPERIMENTS
1	Write a program to implement DFS
2	Write a program to implement BFS
3	Write a Program to find the solution for travelling salesman Problem
4	Write a program to implement Water-Jug problem.
5	Write a program to implement Alpha-Beta Pruning.
6	Write a program to implement 8 puzzle problem.
7	Write a program to implement Towers of Hanoi problem.
8	Write a program to implement A* Algorithm.
9	Write a program to implement Hill Climbing Algorithm.

Course: Written Analysis and Communication			Semester: V
Course Code: BCA 304P	L T P	2 0 2	Credits: 3

OBJECTIVE	To understand the nuances of written communication through a practice-based approach.		
LEARNING OUTCOME	**Upon completion of the course students should be able to:** 1. Imbibe business writing skills. 2. Write case analysis. 3. To express about self.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
		Professional Writing - The Basics ● Written Business Communication Basics ● Being Managerially Appropriate ● Getting it Write the First Time ● Types & orders of paragraph writing	15
		Professional Writing - Applications ● Business Correspondence ● Reports and Summaries ● Informative and Persuasive Communication	15
		Writing Skills Overview ● Planning the Writing Project, Organizing the Content, Writing the first draft, revising the draft, strengthen one's writing skills. ● Written Business Case Analysis Practice. ● Filling questionnaires designed for formal & informal interviews.	15
		Total Hours	**45**
TEXT/ REFERENCE BOOK	1. Bovee, Courtland and Thrill, John; *Business Communication Essentials - A Skills-based Approach to Vital Business*; Prentice Hall.		

Course: Project-I			Semester: V
Course Code: BCA 305P	**L T P**	**0 0 6**	Credits: 3

OBJECTIVE	To develop software to solve the reallife problem by the programming and database concepts they have acquired during the course tenure
LEARNING OUTCOME	On successful completion of the course, students will be able to: Should develop a working software model for any problem they have chooses.

SEMESTER-VI

Course: Data Warehouse and Data Mining			Semester: VI
Course Code: BCA 306	**L T P**	**4 0 0**	Credits: 4

OBJECTIVE	To enable the students to understand concepts of data warehouse and data mining, architectures, applications, design and implementation of data mining and data ware housing concepts.	
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** Understand mathematical foundations of data mining tools. Understand and implement classical models and algorithms in data warehouses and data mining. Characterize the kinds of patterns that can be discovered by association rule, mining, classification, and clustering. Understand data mining techniques in various applications like social, scientific and environmental context. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	Data Mining overview, Data Warehouse and OLAP Technology, Data Warehouse Architecture, OLAP queries, metadata repository, Data Preprocessing – Data Integration and Transformation, Data Reduction, Data Mining Primitives: Data Mining Task, Task-Relevant Data, The Kind of Knowledge to be Mined, KDD	10
	2	Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: Mining A Road Map, The Apriori Algorithm: Finding Frequent Item sets, Improving the Efficiently of Apriori, Mining Frequent Item sets without Candidate Generation, Multilevel Association Rules, Multidimensional Association Rules, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis	15
	3	Introduction to Classification, Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, , Prediction, Linear and Multiple Regression	15

	4	What Is Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Means and k-Medoids,	08
	5	Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods, Agglomerative and Divisive Hierarchical Clustering, Density-Based Methods, Wave Cluster: Clustering Using Wavelet Transformation, CLIQUE: Clustering High-Dimensional Space,	12
		Total Hours	**60**
TEXT BOOKS:	1. M.H.Dunham, "Data Mining: Introductory and Advanced Topics" Pearson Education, 2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier.		
REFERENCE BOOK/ SUGGESTED READING	1. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, lie", Pearson Education.		

Course: Data Analysis with R				Semester: VI
Course Code: BCA 307	**L T P**		**4 0 0**	Credits: 4

OBJECTIVE	To enable the students to understand data analytics, data visualization and statistical model for data analytics using R.		
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Understand key terminologies, concepts and techniques employed in Statistical Analysis. 2. Implement Probability and Probability Distributions to solve a wide variety of problems. 3. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making. 4. Understand, Analyse, Interpret Correlation and Regression. 5. To analyse the underlying relationships between different variables and creating data for analytics.		
COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to Data Analysis:** Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.	10
	2	**R Programming Basics:** Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, R packages.	12
	3	**Data Visualization using R:** Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts	15
	4	**Statistics with R:** Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression,	15
	5	**Prescriptive Analytics:** Creating data for analytics through designed experiments, Creating data for analytics through active learning, Creating data for analytics through reinforcement learning	8
		Total Hours	**60**

TEXT BOOKS:	1. An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16
REFERENCE BOOK/ SUGGESTED READING	1. Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education. 2. Dunlop, Dorothy D., and Ajit C. Tamhane. Statistics and data analysis: from elementary to intermediate. Prentice Hall. 3. G Casella and R.L. Berger, Statistical Inference, Thomson Learning 2002.

+				Semester: VI
Course Code: BCA 307P	**L T P**		**0 0 4**	**Credits: 2**

S.NO	LIST OF SUGGESTED PRACTICAL/EXPERIMENTS
1	Downloading, installing and setting path for R.
2	Write an R script to change the structure of a Data frame
3	Demonstrate the following aggregate functions in R: sum, mean, count, min, max
4	Write an R script to handle missing values in a dataset.
5	Write an R script to handle missing values in a dataset.
6	Write an R script to handle outliers.
7	Write an R script to handle invalid values.
8	Write a program to Perform Logistic Regression analysis on the dataset and plot the results
9	Write a program to Implement K-means algorithm in R.

Course: Project-II				Semester: VI
Course Code: BCA 308P	L T P		0 0 6	Credits: 3

OBJECTIVE	To develop software to solve the real-life problem by the programming and database concepts they have acquired during the course tenure
LEARNING OUTCOME	On successful completion of the course, students will be able to: Should develop a working software model for any problem they have chooses.

Course: Career Skills				Semester: VI
Course Code: BCA 309P	**L T P**		**0 0 2**	Credits: 1

OBJECTIVE	To acquaint students with the concepts of Résumé writing, cover letter and orient them to develop career skills.	
LEARNING OUTCOME	**Upon completion of the course, students will be able to:** 1. Define what a resume is and its purpose. 2. Understand types of resumes. 3. Draft suitable and effective Résumé 4. Develop various sections under Resume building 5. Summarize ways to strengthen the resume appropriately. 6. Create a cover letter 7. Learn Career skills that enables to manage one's career and job.	
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction to Resume Writing** Concept of Résumé Writing, Difference among Resume, Curriculum Vitae, Bio-data, The Function of a Resume, Types of Resumes, Elements of Résumé, -Length, Fronts, Spacing, Layout, Margins and Printing, File Formats, Section Headings-Resume Header, Objective/Summary/Profile statement, Work Status, Experience, Education, Skills, Involvement, Research, Honors and Awards, Publications, Activities and Interests.	04
	2	**Understanding Keywords** About ATS (Applicant Tracking System), Researching Keywords, Using Keywords in Your Resume, Adapting Resumes to Applicant Tracking Systems, Resumes in the Digital Age, Job Search Strategies-Usage Of Online Job Boards And Professional Networking Sites, Employment Exchanges, Recruitment Agencies, and Job Portals respectively.	03
	3	**Tailoring Your Resume** Customizing your resume for specific job opportunities, Analyzing job descriptions and aligning qualifications.	01
	4	**The Cover Letter and Other Application Materials** Understanding the purpose and structure of a cover letter, Developing Professional References, Evaluating alternatives of cover letter, Other Preparations- Key Elements, Basic Rules. Crafting thank-you letters and follow-up emails after interviews, Presence through LinkedIn and other platforms.	03

	5	**Career Skills**	04
		Presentation Skills, Corporate Etiquette, Corporate Telephone Etiquette, Handling Corporate Interviews, Writing an Effective Email, Making Impactful Presentations, Soft Skills, Career Cruising, Understanding Different Interview Formats (e.g., Behavioral, Technical), Practicing Common Interview Questions and Developing Strong Responses, Enhancing Non-Verbal Communication Skills (Body Language, Eye Contact), Following Up After the Interview.	
		Total Hours	**15**
TEXT BOOK:	1. Farr. M., *The Quick Resume & Cover Letter Book: Write and Use an Effective Resume In Just One Day;* JIST Publishing 2. Littleford, D., Halstead.J., and Mulraine. C., *Career Skills: Opening Doors into the Job Market*; Palgrave Macmillan		
REFERENCE BOOK/ SUGGESTED READING	1. Yate.M*., Knock 'Em Dead Resumes: How to Write A Killer Resume That Gets You Job Interviews.* Adams Media 2. Hatch.D., *Write Everything Right;* Direct Marketing IQ 3. Bennett. S., *The Elements of Résumé Style*; American Management Association 4. Ferguson., *Professional Ethics and Etiquette*; Infobase Publishing 5. Siddons. S., *The Complete Presentation Skills Handbook: How to Understand and Reach Your Audience for Maximum Impact and Success*; Kogan Page		

LIST OF ELECTIVES

Group I (Advanced Programming)

Course: Dot Net Technology			Semester:
Course Code: BCA-AP 101	**L T P**	**2 0 4**	Credits: 4

OBJECTIVE	To familiarize with Microsoft.Net, and C# technologies, as well as working with variables, data types, standard programming skills & Windows form.		
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Acquire the knowledge of the structure and model of the programming language C # 2. Understand the use of programming language C # for various programming technologies. 3. Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements. 4. Develop variety of software programs in C # 5. Understand Distributed Application in C#,		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**The .NET Framework:** Introduction, Common Language Runtime, Common Type System, Common Language specification, The Base Class Library, The .Net class library Intermediate language, Just-in time Compilation, Garbage Collection, Application Installation and Assemblies, Web services, Unified classes.	15
	2	**C# Basics:** Introduction, Data Types, Identifiers, Variables and constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System collections, Delegates and Events, Indexes, Attributes, versioning.	12
	3	**C# Using Libraries:** Namespace- System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in web application, Error Handling	10
	4	**Advanced Features Using C#:** Web services, Windows services, messaging, Reflection, COM and C#, Localization	10

	5	**Advanced Features Using C#:** Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, CASE Study (Messenger Application)	13
		Total Hours	**60**
TEXTBOOKS:	1. Jeffrey Richter, "Applied Microsoft. NET Framework Programming", (Microsoft) 2. Fergal Grimes, "Microsoft .Net for Programmers", (SPD)		
REFERENCE BOOK/ SUGGESTED READING	1. Balagurusamy, "Programming with C# ", TMH 2. Wiley," Beginning Visual C# 2008", Wrox		

Course: Advanced Java Programming			Semester:
Course Code: BCA-AP102	**L T P**	**2 0 4**	Credits: 4

OBJECTIVE	Be able to put into use the advanced features of the Java language to build and compile robust applications
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. Understand Graphical User Interface (GUI) networking, and database manipulation. 2. Students learn to access database through Java programs, using Java Database Connectivity (JDBC). 3. Use advanced technology in Java such as Internationalization, and Remote method Invocation. 4. Learn how to work with Servelets. 5. Develop web application using Java Servlet and Java Server Pages technology.

COURSE DETAILS	Module No.	Topic	Hours
	1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components: Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons	12
	2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content and Protocol Handlers	15
	3	RMI architecture, RMI registry, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers	8
	4	Server-side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Event handling, Introduction to filters with writing simple filter application	15
	5	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library	10
		Total Hours	**60**
TEXT BOOKS:	1. Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education (India) Private Limited, New Delhi.		

IMS Unison University

REFERENCE BOOK/ SUGGESTED READING	1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI. 2. Introduction to Java programming, By Y.DanielLiang, Pearson Publication.

Course: Mobile Programming			Semester:
Course Code: BCA-AP103	L T P	2 0 4	Credits: 4

OBJECTIVE	The student will learn the basics of Android platform and get to understand the application lifecycle		
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Learn the basic and important design concepts and issues of development of mobile applications. 2. To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles. 3. Experiment with the method of storing, sharing and retrieving the data in Android Applications. 4. Examine responsive user interface across wide range of devices. 5. Create a mobile Application by using various components like activity, views, services, content providers and receivers.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Mobile Application Development** Mobile Applications and Device Platforms - Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Lifecycle-The Mobile Application Front-End-The Mobile Application Back-EndKey Mobile Application Services-What is Android-Android version history-Obtaining the Required Tools-Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application.	12
	2	**Understanding Activities** Linking Activities Using Intents-Fragments-Displaying Notifications- Understanding the Components of a Screen-Adapting to Display Orientation-Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications.	08
	3	**Using Basic Views** Using Picker Views -Using List Views to Display Long Lists-Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with ViewsUsing WebView-Saving and Loading User Preferences-Persisting Data to Files-Creating and Using Databases.	15
	4	**Sharing Data in Android-Creating Your Own Content Providers** Using the Content Provider- SMS Messaging -Sending	15

		Email-Displaying Maps- Getting Location Data- Monitoring a Location.	
	5	Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading.	10
		Total Hours	**60**
TEXT BOOKS:	1. Jerome DiMarzio, "Beginning Android Programming with Android Studio".		
REFERENCE BOOK/ SUGGESTED READING	1. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide". 2. Neil Smyth, "Android Studio 3.0 Development Essentials: Android". 3. Pradeep Kothari, "Android Application Development (With Kitkat Support)", Black Book.		

Course: Advanced Web Technology with PHP				Semester:	
Course Code: BCA-AP104	**L T P**		2 0 4	**Credits: 4**	

OBJECTIVE	Student will be able to learn Advanced Web Technologies with the concept of PHP and PHP-MySQL.
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. Students are able to develop a dynamic webpage by the use of HTML. 2. Students will be able to write a well-formed / valid XML document. 3. Students will be able to understand General Syntactic Characteristics 4. Students will be able to understand basic PHP programming. 5. Students will be able to write a server-side java application called JSP to catch form data sent from client and store it on database.

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to Internet:** Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers. HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, frames and frame sets, Overview and features of HTML5.	10
	2	**Style sheets:** Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes. XML, DTD and Schemas. Frameworks: Introduction to Bootstrap. Creating responsive webpages with bootstrap. JavaScript: Introduction to JavaScript, The Basics of JavaScript: Overview of JavaScript, Object Orientation and JavaScript.	12
	3	**General Syntactic Characteristics-** Primitives, Operations, and expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Callback Functions, Java Script HTML DOM, Ajax - Introduction, advantages & disadvantages, Purpose of it, ajax based web application. jQuery - Introduction to jQuery: Overview and Basics	8
	4	**Introduction to PHP:** PHP Basics Syntax, PHP Variables, Global Array and Expression, PHP Operators, PHP Conditional Events and Switch case, PHP Flow Control and Loops, Types of Errors, Array, For each Loop, String Manipulation and Regular Expression, Global Array, String inbuilt functions, Math functions, Array Inbuilt functions	15

	5	Using HTML Forms: PHP form handling, get data sent from form fields through GET and POST method, form validation, sessions and cookies. Introduction to PHP MySQL: PHP-MySQL Connection overview, 3 different approaches – procedure, object oriented, PDO; PHP-MySQL function to connect to database, access database, fetch result.	**15**
		Total Hours	**60**
TEXT BOOKS:	1. Powell, A. Thomas, HTML & XHTM: The Complete Reference, Tata McGraw Hill 2. Steven Holzner-2008-PHP: The Complete Reference, McGraw-Hill Higher Education		
REFERENCE BOOK/ SUGGESTED READING	1. Robin Nixon, Learning PHP, My SQL and Java Script Kindle Edition -OReilly Media		

Group II (Cloud Technology & Information Security)

Course: Network Security and Cryptography			Semester:
Course Code: BCA-CI101	**L T P**	**3 1 0**	Credits: 4

OBJECTIVE	Understand various cryptographic algorithms and basic categories of threats to computers and networks.	
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Identify the various attacks and its issues. 2. Learn usage of cryptographic algorithms for avoiding basic level threats. 3. Comprehend the issues involved in Integrity, Authentication and Key Management techniques. 4. Realize the importance of user authentication and Kerberos concepts. 5. Acquire the knowledge of network and system security domain.	
COURSE DETAILS	**Module No.** / **Topic** / **Hours**	

	Module No.	Topic	Hours
	1	**Introduction of Cryptography:** Introduction To security: Attacks, Services and Mechanisms, Conventional Encryption: Conventional Encryption Model, Steganography, Block Cipher Principles, DES Standard, DES Strength, Differential and Linear Crypt analysis, Block Cipher Modes of Operations. Double DES, Triples DES, Blowfish, International Data Encryption Algorithm, Placement of Encryption Function, Key Distribution, Random Number Generation and Traffic confidentiality	15
	2	**Number Theory and Public Key Encryption:** Fermat's and Euler's Theorem, Primality Testing, Chinese Remainder Theorem, Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm.	08
	3	**Key Management:** Key Management scenario in secret key and public key cryptography, Diffie Hellman Key Exchange algorithm, OAKLEY and ISAKMP key management protocol, Elliptic Curve Cryptography	10
	4	**Hash Functions:** Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks, Security of Hash Function and MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures, Digital Signature Standard (DSS).	15

	5	**Network and System Security:** Authentication Applications: Kerberos, X.509, Electronic Mail Security, Pretty Good Privacy (PGP),S/Mine Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.	12
		Total Hours	**60**
TEXT BOOKS:	1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education. 2. Atul Kahate, Cryptography and Network Security, Mc Graw Hill.		
REFERENCE BOOK/ SUGGESTED READING	1. C K Shyamala, N Harini, Dr. T.R. Padmanabhan, Cryptography and Network Security, Wiley India. 2. Forouzan Mukhopadhyay, Cryptography and Network Security, Mc Graw Hill. 3. Mark Stamp, Information Security, Principles, and Practice, Wiley India		

Course: Virtualization and Cloud Computing			Semester:
Course Code: BCA-CI102	L T P	3 1 0	Credits: 4

OBJECTIVE	Provides an insight into cloud computing and enable students to understand concept of application-based building blocks for processing of data	
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Understand the key dimensions of the challenges and benefits of Cloud Computing. 2. Describe the principles of Parallel and Distributed Computing and evolution of cloud Computing from existing technologies. 3. Implement different types of Virtualization technologies and Service Oriented Architecture systems. 4. Choose among various cloud technologies for implementing applications. 5. Install and use current cloud technologies.	
COURSE DETAILS	**Module No.** / **Topic** / **Hours**	

	Module No.	Topic	Hours
	1	**Introduction:** Cloud-definition, benefits, usage scenarios, History of Cloud Computing, Cloud Architecture, Types of Clouds, Players in Cloud Computing, issues in Clouds.	08
	2	**Cloud Services:** Types of Cloud services, Software as a Service, Platform as a Service, Infrastructure as a Service, Database as a Service, Monitoring as a Service, Communication as services. Service Providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	15
	3	Collaborating Using Cloud Services Email Communication over the Cloud, CRM Management, Project Management, Event Management, Task Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks and Groupware.	10
	4	Virtualization for Cloud Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, System VM, Process VM, Virtual Machine monitor, Virtual machine properties, HLL VM, Hypervisors, Xen, KVM, VMWare, Virtual Box, Hyper-V.	15
	5	**Cloud Security:** Infrastructure Security- Network level security, Host level security, Application level security, Data security, Authentication in cloud computing, Cloud security challenges.	12
		Total Hours	**60**

TEXT BOOKS:	1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier. 2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press.
REFERENCE BOOK/ SUGGESTED READING	1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India. 2. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson. 3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers.

Course: Wireless Communications and VOIP Security			Semester:
Course Code: BCA-CI103	**L T P**	**3 1 0**	**Credits: 4**

OBJECTIVE	Understand the different routing protocols have an in-depth knowledge on network architecture and design issues		
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Demonstrate their understanding of the functioning of wireless communication systems and evolution of different wireless communication systems and standards. 2. Compare different technologies used for wireless communication systems. 3. Explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks. 4. Demonstrate an ability explain multiple access techniques for Wireless Communication 5. Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction:** Introduction to Wireless Networks - Wireless Network Topologies -Characteristics of the Wireless Medium -GSM Cellular Network concept – Cellular transmission principles Typical cell layout - Signals Transmission interference- Cell splitting - TDMA technology – Spread spectrum and CDMA technology - GPRS – 3G- 4G and Long term evolution- 5G	08
	2	**Wireless LAN Standards:** Evolution of IEEE 802.11- Introduction to IEEE 802.11 - General Description- Medium Access Control (MAC) for the IEEE 802.11 -WLANs Physical Layer for IEEE 802.11 - WLANs; Radio systems -IR Systems Applications	10
	3	**Bluetooth:** Bluetooth and IEEE 802.15- Bluetooth Specifications - Bluetooth Architectures - Bluetooth Protocols - Bluetooth Service Discovery - Bluetooth MAC - Bluetooth Packet Structure - Bluetooth Audio - Bluetooth Addressing - Bluetooth Limitations – Zigbee	15

	4	**WAP:** The WAP Forum - WAP Service Model - WAP Protocol Architecture - WAP Programming Model – Mobile applications and Mobile IP - Mobile adhocnetworks (MANET) Wireless Routing Protocol - Cluster Switch Gateway Routing (CSGR) - Ad Hoc On-Demand Distance Vector Routing (AODV). Dynamic Source Routing (DSR) - Zone Routing Protocol (ZRP) - Source Tree Adaptive Routing (STAR).	15
	5.	**Satellite Communication:** Overview of Satellite Systems - Orbits and Launching Methods - Geostationary Orbit - Radio Wave propagation - Interference - Satellite Access - Satellites in Networks - Direct Broadcast Satellite (DBS) Television - Satellite Services - INSAT, VSAT, Remote Sensing- Satellite Mobile and Specialized Services.	12
		Total Hours	**60**
TEXT BOOKS:	1. Cory Beard, William Stallings, Wireless Communication Networks and Systems, Pearson. 2. William Stallings, Wireless communications, and Networks, Pearson Education Asia		
REFERENCE BOOK/ SUGGESTED READING	1. Jochen Schiller, Mobile Communications, 2nd Edition, Addison-Wesley. 2. Chai-KeongToh, AdHoc Mobile Wireless Networks: Protocols and Systems, Addition Wesley. 3. Dennis Roddy, Satellite Communications, McGraw hill.		

Course: Ethical Hacking and Cyber Law			Semester:
Course Code: BCA-CI104	**L T P**	**3 1 0**	**Credits: 4**

OBJECTIVE	To learn concepts, techniques, and tools to deal with Ethical Hacking.	
LEARNING OUTCOME	**On successful completion of the course, students will be able to:** 1. Remember the broad set of technical, social & political aspects of Cyber Security. 2. Understand the importance of ethical hacking, its tools and ethical hacking process. 3. Analyze security principles to system design. 4. Understand the methods for authentication, access control, intrusion detection and Prevention in Cyber Security. 5. Understand the method for Intrusion Detection Systems and Detection Tools.	

COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to Cyber Security:** Importance and challenges in Cyber Security, Cyberspace, and Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure	10
	2	**Hackers and Cyber Crimes:** Types of Hackers - Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access – Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks. Worms, Trojans, Viruses, Backdoors.	15
	3	**Ethical Hacking and Social Engineering:** Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modeling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social Engineering Targets and Defence Strategies	15
	4	**Cryptography:** Cryptography in Practice, Historical Perspectives - Algorithms - Hashing Functions - Symmetric Encryption, Asymmetric Encryption, Quantum Cryptography, Cryptography Algorithm Uses	10
	5	**Intrusion Detection Systems:**	10

		History of Intrusion Detection Systems, IDS Overview, Network-Based IDSs, Host-Based IDSs, Intrusion Prevention Systems, Honeypots and Honeynets - Tools.	
		Total Hours	**60**
TEXT BOOKS:	1.	James S. Tiller, The Ethical Hack: A Framework for Business Value Penetration Testing, Auerbach Publications, CRC Press.	
REFERENCE BOOK/ SUGGESTED READING	1. 2. 3.	Nina Godbole, Sumit Belapure, "Cyber Security", Willey. Roger Grimes, "Hacking the Hacker", Wiley. Yuri Diogenes, Cybersecurity - Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics, Pearson.	

Group III (Business Analytics)

Course: Machine Learning			Semester:
Course Code:BCA-BA101	**L T P**	**3 1 0**	Credits: 4

OBJECTIVE	Understand the need for machine learning for problem solving and study the various algorithms in machine learning.		
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. Learn the basics of learning problems with hypothesis and version spaces. 2. Understand the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning. 3. Analyze the concept of neural networks for learning linear and non-linear activation functions. 4. Learn the concepts in tree, probability and graphical based models and methods. 5. Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems.		
COURSE DETAILS	Module No.	Topic	Hours
	1	**Introduction to Machine Learning:** Introduction, Perspectives & Issues in ML, designing learning systems, Concepts of hypotheses, Version space, inductive bias, Performance metrics-accuracy, precision, recall, sensitivity, specificity, AUC, RoC.	10
	2	**Supervised Learning:** Decision Trees Leaming: Basic algorithm (ID3), Issues in Decision Tree Leaming - Overfitting, Solutions to overfitting. Instance-based learning: k-nearest neighbour learning. Support Vector Machines: Introduction, Handling data that are linearly separable. Artificial Neural networks: Introduction, Perceptrons, Multi-layer networks and back-propagation.	15
	3	**Probabilistic and Stochastic Models:** Bayesian Learning - Bayes theorem, Concept learning, Maximum likelihood, Bayes optimal classifier, Naive Bayes classifier. Expectation Maximization and Gaussian Mixture Models, Hidden Markov models.	12
	4	**Association Mi ning and Unsupervised Learning :** Association Mining: Apriori algorithm. Finding frequent itemsets, mining association rules, FP- growth - FP trees, mining frequent items from an FP-Tree. Hierarchical vs non-hiera	15

		rchica l clustering, Agglomerative and divisive clustering, K-means clustering, K-medoid clustering,	
	5	**Genetic Algorithms** Genetic Algorithms - Representing hypothesis, Genetic operators and Fitness function and selection, Simple applications of the Genetic Algorithm, application of GA in Decision tree, Genetic Algorithm based clustering	08
		Total Hours	**60**
TEXT BOOKS:	1. Ethem Alpaydin,"Introduction to Machine Leaming", MIT Press, Prentice Hall of India. 2. Jiawei Han and Micheline Kambers and Jian Pei, "Data Mining -Concepts and Techniques", Morgan Kaufman Pub		
REFERENCE BOOK/ SUGGESTED READING	1. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press. 2. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press. 3. Tom Mitchell, "Machine Learning", McGraw Hill Education (India).		

Course: Generative AI				Semester:
Course Code: BCA-BA102	**L T P**		**2 0 4**	**Credits: 4**

OBJECTIVE	Dive deep into the world of generative AI, exploring cutting-edge techniques and practical applications across various domains. Through a combination of expert-led sessions, hands-on exercises, and collaborative projects, you'll gain a solid understanding of the underlying principles and tools used in generative AI.		
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. Describe the core concepts and advantages of Generative AI. 2. Utilizing leading Language Models and LLM Architectures. 3. Implement Basic Generative Pre-trained Transformer like Chat GPT. 4. Understand the practical applications of GPT and apply it in your problem solution. 5. Understand and use the concepts of prompt engineering.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction to Generative AI:** Definition and scope of Generative AI Overview of generative models and their applications Importance of Generative AI in various domains Brief discussion on ethical considerations and challenges	10
	2	**Language Models and LLM Architectures:** Introduction to language models and their role in AI Traditional approaches to language modeling Deep learning-based language models and their advantages Overview of popular LLM architectures: RNNs, LSTMs, and Transformers	12
	3	Generative Pre-trained Transformer: Introduction to GPT and its significance Pre-training and fine-tuning processes in GPT Architecture and working of GPT models Overview of GPT variants and their use cases	8
	4	A Practical Application of GPT: Introduction to ChatGPT and its purpose Training data and techniques for ChatGPT Handling user queries and generating responses Tips for improving ChatGPT's performance	15
	5	Prompt Engineering: Enhancing Model Outputs Understanding the concept and significance of prompt engineering Strategies for designing effective prompts Techniques for controlling model behavior and output quality Best practices for prompt engineering in generative AI	15
		Total Hours	**60**

TEXT BOOKS:	1. Jesse Roberts PhD, Gaining An Edge In Life & Business With AI Unleashing the Power of Generative AI and Chat GPT (Kindle Edition).
	2. Amir Husain, Generative AI for Leaders; Kindle Edition.
REFERENCE BOOK/ SUGGESTED READING	1. Gandhi, S., Ehl,C., Generative AI: The Future of Everything; Kindle Edition.

Course: Low Code No Code				Semester:
Course Code: BCA-BA103	**L T P**	**2 0 4**	**Credits: 4**	

OBJECTIVE	Understand the principles and benefits of LCNC development and navigate and utilize popular LCNC platforms such as deployment of applications using NCNC tools.		
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. Describe the core concepts and advantages of LCNC developments. 2. Utilizing leading LCNC platforms to create, test, and deploy applications. 3. Implement Basic design principles to enhance user experience and functionality. 4. Integrating LCNC applications with existing systems and databases. 5. Analyze and solve business problems by developing tailored LCNC solutions.		
COURSE DETAILS	**Module No.**	**Topic**	**Hours**
	1	**Introduction to Low Code/No Code:** Gain a comprehensive understanding of what low code and no code development entail. Explore real-world use cases and success stories, Exploring low-coding solutions & databases: dataverse concepts, data storing solutions, basic app user interface development.	10
	2	**Basic low-code application development:** modifying forms, adding controls, displaying data. Advanced Low-code application development: model driven apps, common data model integration.	12
	3	**Mobile asset tracking:** integrate API's, extract datasets from GPS, Barcodes and QR codes Mixed reality integration into application: adding 3D environment tools. Automating processes: Power Automate concepts, business processes automation. Building an advanced automated solution.	8
	4	**Getting started with data visualization tools:** Using advanced tools for data visualization, modeling, and analysis: creating reports with PowerBI. Working with PowerBI more efficiently: connecting, transforming, and visualizing the data	15
	5	**Introduction to Power Virtual Agents:** building, testing, and deploying simple chatbot, Enhancing Power Virtual Agents bots: using Power Automate to add actions; managing topics.	15
		Total Hours	**60**

TEXTBOOKS:	1. Cox, J., Lambert, J., Microsoft Access 2013: Step by Step. Redmond: Microsoft Press. 2. Weston, M., Learn Microsoft PowerApps. Birmingham: Packt Publishing Ltd.
REFERENCE BOOK/ SUGGESTED READING	1. Mendoza, E., Microsoft Power Apps Cookbook. Birmingham: Packt Publishing Ltd. 2. Pertilä, T. Power Apps and Mixed reality. Available online @ elearning.ism.lt. 3. Introduction to Dataverse. Available online @ elearning.ism.lt. 4. Get started using Dataverse. Available online @ elearning.ism.lt. 5. Create apps, chatbots, flows, and more with Microsoft Dataverse and Teams. Available online @ elearning.ism.lt. 6. Create bots with Power Virtual Agents. Available online @ elearning.ism.lt. 7. Automate a business process using Power Automate. Available online @ elearning.ism.lt. 8. Microsoft Power Platform Fundamentals. Available online @ elearning.ism.lt. 9. Get started with Power BI. Available online @ elearning.ism.lt. 10. Create and use analytics reports with Power BI. Available online @ elearning.ism.lt.

Course: SOFTWARE TESTING			Semester:
Course Code: BCA-BA104	**L T P**	**3 1 0**	**Credits: 4**

OBJECTIVE	To study fundamental concepts in software testing and discuss various software testing issues and solutions in software.
LEARNING OUTCOME	On successful completion of the course, students will be able to: 1. List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects. 2. Distinguish characteristics of structural testing methods. 3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. 4. Discuss the functional and system testing methods. 5. Demonstrate various issues for object-oriented testing.

COURSE DETAILS	Module No.	Topic	Hours
	1	Fundamental of Test and Analysis: Software Test and Analysis in a Nutshell: Engineering Process and Verification, Basic Questions; When do Verification and Validation Start and End? What Technique should be Applied? How can we Assess the Readiness of a Product? How can we ensure the Quality of Successive Releases? A Framework for Test and Analysis: Validation and Verification, Degrees of Freedom, Verities of Software. Basic Principles: Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback. Test and Analysis Activities within a Software Process: The Quality Process, Planning and Monitoring, Quality Goals, Dependability Properties, Analysis, Testing, Improving the Process and Organizational Factors.	10
	2	Problems and Methods: Test Case Selection and Adequacy: Test Specification and Cases, Adequacy Criteria, Comparing Criteria, Functional Testing: Random versus Partition Testing Strategies, A Systematic Approach, Choosing a Suitable Approach, Combinatorial Testing: Category-Partition Testing, Pairwise Combination Testing, Catalog-Based Testing, Strnctural Testing: Statement Testing, Branch Testi ng, Condition Testing, Path Testing, Procedure Call Testing, Comparing Structural Testing Criteria.	12
	3	Data Flow Testing: Definition-Use Associations, Data Flow Testing Criteria, Data Flow Coverage with Complex Structures, The Infeasibility Problem. Testing Object Oriented Software: Issues in Testing Object Oriented Software, An Orthogonal Approach to Test, Intraclass Testing, Testing with State	15

		Machine Models, Interclass Testing, Structural Testing of Classes, Oracles for Classes, Polymorphism and Dynamic Binding, Inheritance, Genericity and Exception.	
	4	Process: Planning and Monitoring the Process: Quality and Process, Test and Analysis Strategies, Test and Analysis Plans, Risk Planning, Monitoring the Process, Improving the Process, The Quality Team. Integration and Component-based Software Testing: Integration Testing Strategies, Testing Components and Assemblies. System, Acceptance and Regression Testing: System Testing, Acceptance Testing, Usability, Regression Testing, Regression Test Selection Techniques, Test Case Prioritization and Selective Execution.	08
	5	Model Based Testing: Deriving Test Cases from Finite State Machines, Testing Decision Structures, Deriving Test Cases from Control and Data Flow Graphs, Deriving Test Cases from Grammars. Automating Analysis and Test: Automation and Planning, Process Management, Static Metrics, Test Case Generation and Execution, Static Analysis and Proof, Cognitive Aids, Version Control, Debugging, Choosing and Integrating Tools. Documenting Analysis and Test: Organizing Documents, Test Strategy Document, Analysis and Test Plan, Test Design Specification Documents, Test and Analysis Reports.	15
		Total Hours	**60**
TEXT BOOKS:	1.	Mauro Pezze, Michal Young, Software Testing and Analysis, Process, Principles and Techniques, John Wiley & Sons.	
REFERENCE BOOK/ SUGGESTED READING	2. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, Auerbach Publications. 3. Brian Marrick: The Craft of Software Testing, Pearson. 4. Aditya P Mathur: Foundations of Software Testing, Pearson.		