LINGAYA'S VIDYAPEETH

School of Computer Applications

Scheme & Syllabus

Of

BCA (Data Science)

Batch: 2024-2028

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VISION

To be a school, committed to education, research & innovation and develop globally competent professionals in the area of Computer Science, Information Technology and Computer Applications who are responsible citizens and have respect for life and sensitivity towards environment.

MISSION

1. To develop professionals and leaders in Computer Science, IT and allied areas who have right attitude and aptitude to serve the society.

2. To develop and maintain state-of-the-art infrastructure and research facilities to enable create, apply and disseminate knowledge.

3. To foster linkages with all stakeholders for continuous improvement in academics in Computer Science, IT and Computer Applications.

4. To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge who have deep respect for human life and values.

5. To undertake disciplinary and inter-disciplinary collaborative research and innovation which offer opportunities for long term interaction with academia and industry and develop technologies relevant to the society.

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PROGRAM OUTCOMES:

PO1- Engineering Knowledge: Apply the knowledge of mathematics, science, engineering and Application fundamentals, and an engineering and Application specialization to the solution of complex engineering problems.

PO2- Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3-Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4- Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5- Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6- The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7- Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9- Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10- Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design

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documentation, make effective presentations, and give and receive clear instructions.

PO11- Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12- Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES:

PSO1: To equip the students with theoretical and implementation knowledgebase in all the latest areas of Computer Science & Engineering for a successful career in software industries, pursuing higher studies, or entrepreneurial establishments.

PSO2: To nurture the students with the critical thinking abilities for better decision making by offering them a socially acceptable solutions to real life problems through computing paradigm.

PSO3: To nurture the students with the comprehensive analytical and design abilities by offering them techno-commercially feasible solutions of real business problems through computing.

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2024-25

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 1st**
	Semester : I

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-101E	Fundamentals of Computer Systems & Emerging Technology	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-103E	Problem Solving Using C	3	0	0	3	15	25	60	-	-	100
3	PEC	EC-108	Digital Electronics	3	0	0	3	15	25	60	-	-	100
4	BSC	BS-117	Computational Mathematics-I	3	0	0	3	15	25	60	-	-	100
5	HSMC	HSS-107	English & Communication skills	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-105E	Internet and Web Development	3	0	0	3	15	25	60	-	-	100
7	PEC	BCA-107E	Fundamentals of Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-153E	Problem Solving Using C Lab	0	0	2	1	-	-	-	60	40	100
9	PEC	EC-158	Digital Electronics Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	BCA-155E	Internet and Web Development Lab	0	0	2	1	-	-	-	60	40	100
11			YOGA	0	0	0	0						
			Total	21	0	6	24						

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2024-25

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 1st**
	Semester : II

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-102E	Operating System	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-104E	Data base Management System	3	0	0	3	15	25	60	-	-	100
3	PCC	BCA-106E	Data Structure using C++	3	0	0	3	15	25	60	-	-	100
4	PCC	BCA-108E	Discrete Structures	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-110E	Python Programming	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-112E	Knowledge Representation & Reasoning	3	0	0	3	15	25	60	-	-	100
7	MC	CE-108	Environmental Science & Ecology	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-160E	Python Programming Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-156E	Data Structure using C++ Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	BCA-154E	Data base Management System Lab	0	0	2	1	-	-	-	60	40	100
11	PCC	BCA-192E	Coding & Computation Thinking-I	0	0	2	1	-	-	-	60	40	100
12	AUC	VAC-102E	Value added Course-I	0	0	0	0	-	-	-	-	-	50
			Total	21	0	8	25						

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2025-26

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 2nd**
	Semester : III

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-201E	Computer architecture & Organization	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-203E	Computer Networks	3	0	0	3	15	25	60	-	-	100
3	PCC	BCA-205E	Object-Oriented Programming using Java	3	0	0	3	15	25	60	-	-	100
4	PEC	BCA-DS-203E	Data Wrangling & pre-processing	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-DS-201E	Data mining & Warehousing	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-211E	Design Analysis & Algorithm	3	0	0	3	15	25	60	-	-	100
7	PCC	BCA-DS-251E	Data mining & Warehousing Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	BCA-255E	Object-Oriented Programming using Java Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-291E	Coding & Computing Thinking-II	0	0	4	2	-	-	-	60	40	100
10	PEC	PEC-CS-201E	MOOC Course-I (NPTEL)	2	0	0	2	-	-	-	-	-	100
			Total	20	0	8	24						

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SCHEME OF STUDIES
SESSION: 2025-26

School : School of Computer Applications	Batch : 2024– 27
Course : BCA(DATA SCIENCE)	Year : 2nd
	Semester : IV

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-202E	Software Engineering & Testing	3	1	0	4	15	25	60	-	-	100
2	PEC	ABMA-CS	Academic Basket (Preference - I)	4	0	0	4	15	25	60	-	-	100
3	PEC	ABMI-CS	Academic Basket (Preference – II)	2	0	0	2	15	25	60	-	-	100
4	PCC	BCA-206E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-DS-202E	R Programming for Data Science	3	0	0	3	15	25	60	-	-	100
6	PEC		Elective –I	3	0	0	3	15	25	60	-	-	100
7	PCC	BCA-256E	Artificial Intelligence Lab	0	0	2	1	-	-	-	60	40	100
8	PEC	BCA-DS-252E	R Programming for Data Science Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-260E	MongoDB	0	0	4	2	-	-	-	60	40	100
10	PROJ	PROJ-292E	Minor Project	0	0	4	2	-	-	-	60	40	100
11	AUC	VAC-202E	Value Added Courses	0	0	0	0	-	-	-	-	-	50
			Total	18	1	12	25						

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2026-27

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 3rd**
	Semester : V

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-301E	Software Project Management	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-303E	Computer Graphics & Multimedia	3	0	0	3	15	25	60	-	-	100
3	PEC	BCA-DS-301E	Business Data Analytics	3	0	0	3	15	25	60	-	-	100
4	PEC	ABMA-CS	Academic Basket (Preference-I)	4	0	0	4	15	25	60	-	-	100
5	PEC	ABMI-CS	Academic Basket (Preference-II)	2	0	0	2	15	25	60	-	-	100
6	PCC	BCA-307E	Data Visualization (Power BI)	3	0	0	3	15	25	60	-	-	100
7	PEC		Elective-II	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-DS-357E	Data Visualization (Power BI) Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-353E	Computer Graphics & Multimedia Lab	0	0	2	1	-	-	-	60	40	100
10	PROJ	PROJ-391E	Major Project	0	0	8	4	-	-	-	60	40	100
11	PEC	PEC-CS-301E	MOOC Course-II (NPTEL)	2	0	0	2	-	-	-	-	-	100
			Total	23	0	12	29						

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2026-27

School : School of Computer Applications	**Batch : 2024 – 27**
Course : BCA(DATA SCIENCE)	**Year : 3rd**
	Semester : VI

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PROJ	PROJ-392E	Internship/ Major Project	0	0	40	20	-	-	-	60	40	100
2	PEC	PEC(CS)-302E	MOOC Course-III(NPTEL)	3	0	0	3	-	-	-	-	-	100
			Total	3	0	40	23						

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SCHEME OF STUDIES
SESSION: 2024-27

	Code	Subjects
Elective-I	BCAE-208E	Introduction to E-Commerce
	BCAE-204E	Mobile Computing
	BCAE-206E	Cryptography & Data Compression
Elective- II	BCAE-301E	Internet of Things(IoT)
	BCAE-303E	Digital Marketing
	BCAE-305E	UI/UX Design

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Syllabus

of

BCA(DS)

1st Semester

&

2nd Semester

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SCHEME OF STUDIES
SESSION: 2024-25

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 1st**
	Semester : I

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-101E	Fundamentals of Computer Systems & Emerging Technology	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-103E	Problem Solving Using C	3	0	0	3	15	25	60	-	-	100
3	PEC	EC-108	Digital Electronics	3	0	0	3	15	25	60	-	-	100
4	BSC	BS-117	Computational Mathematics-I	3	0	0	3	15	25	60	-	-	100
5	HSMC	HSS-107	English & Communication skills	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-105E	Internet and Web Development	3	0	0	3	15	25	60	-	-	100
7	PEC	BCA-107E	Fundamentals of Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-153E	Problem Solving Using C Lab	0	0	2	1	-	-	-	60	40	100
9	PEC	EC-158	Digital Electronics Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	BCA-155E	Internet and Web Development Lab	0	0	2	1	-	-	-	60	40	100
11			YOGA	0	0	0	0						
			Total	21	0	6	24						

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SCHEME OF STUDIES
SESSION: 2024-25

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 1st**
	Semester : II

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-102E	Operating System	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-104E	Data base Management System	3	0	0	3	15	25	60	-	-	100
3	PCC	BCA-106E	Data Structure using C++	3	0	0	3	15	25	60	-	-	100
4	PCC	BCA-108E	Discrete Structures	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-110E	Python Programming	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-112E	Knowledge Representation & Reasoning	3	0	0	3	15	25	60	-	-	100
7	MC	CE-108	Environmental Science & Ecology	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-160E	Python Programming Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-156E	Data Structure using C++ Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	BCA-154E	Data base Management System Lab	0	0	2	1	-	-	-	60	40	100
11	PCC	BCA-192E	Coding & Computation Thinking-I	0	0	2	1	-	-	-	60	40	100
12	AUC	VAC-102E	Value added Course-I	0	0	0	0	-	-	-	-	-	50
			Total	21	0	8	25						

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BCA-101E	FUNDAMENTALS OF COMPUTER SYSTEMS & EMERGING TECHNOLOGY	L-T-P	Credits
		3-0-0	3

OBJECTIVE

To introduce the basic concepts of computers as well as different emerging technologies.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the history, different types came into existence via generations of the computer

CO2: To understand the different hardware and their usage

CO3: To learn the different number systems and their conversions

CO4: To learn about the operating system and its need

CO5: To know about the different technologies to be emerged in different areas

UNIT 1

INTRODUCTION TO COMPUTERS: Basics of Computers, Data -Process -Information cycle, Classification of Computers by - Data Processed Analog, Digital and Hybrid, by - First to Fifth Generation, by Processing Capabilities - Micro, Mini, Mainframe and Super Computer Simple Model of Computer Input Devices CPU (Central Processing Unit) Arithmetic & Logic Unit Control Unit Internal Memory Output Devices Secondary Storage Devices, Input and output devices

UNIT II

Internal / External parts of Computer cabinet, Mother board ,Processors Dual Core, Core 2 Duo, i2, i3, etc. , Memory structure and Types of Memory, Slots, Sockets ,Cables, Ports, USB / Serial / Parallel / PS2, Graphic Cards, Data Storage: Introduction, Type of Magnetic Storage Devices, Storage Mechanism of Magnetic Storage Devices: Tracks / Sectors / Clusters / Cylinders, Reading / Writing Data to and from Storage Devices, Seek Time / Rotational Delay – Latency / Access Time / Response Time, Other Storage Devices.

UNIT III

Numbering System and Codes, Introduction to Binary Codes, Nibble / Bit / Byte / Carry Bit / Parity Bit / Sign Bit, KB / MB / GB / TB / HB / etc., Type of Numbering System, Binary / Octal / Decimal / Hexa-Decimal, Conversion, Binary to Octal, Decimal and Hexa-Decimal,

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Decimal to Binary, Octal and Hexa-Decimal, Octal to Binary, Decimal and Hexa-Decimal, Hexa-Decimal to Binary, Octal and Decimal, Binary Arithmetic, Addition, Subtraction (1's Compliment and 2's Compliment), Division, Multiplication, Type of Code, ASCII / BCD / EBCDIC / Unicode, Parity Check, Event Parity System / Odd Parity System

UNIT IV

Languages, Operation System and Software Packages, Introduction, Types of Languages (Assembler / Compiler / Interpreter), Machine Level Language, Assembly Level Language, High Level Language (3GL, 4GL, 5GL, etc.), Type of Operation Systems, Batch Operating System, Multi-Processing Operating System,. Time Sharing Operating System, Online and Real Time Operating System, Type of Software Packages, Word Processing Package,s, Spread Sheet Packages, Graphical Packages, Database Packages, Presentation Packages, Animation / Video / Sound Packages

UNIT V

Emerging Technologies and Virus, Introduction, Different Communication Methods, GIS / GPS / CDMA / GSM, Communication Devices, Cell Phones / modem / Infrared / Bluetooth / Wi-Fi, Virus, Introduction to Virus and related terms, Origin and History, Types of Virus, Problems and Protection from Virus,. Important Terms and Acronyms, ATM, Backup / Restore, Hard Copy / Soft Copy, Bus / Data Bus, Buffer and Types / Spooling, Cursor / Pointer / Icon, E-Mail / Attachment, CLI / GUI, Compiler and its types, Drive / Directory (Folder) / File / Path, Menu / Popup Menu / Toolbar, Shutdown / Reboo, / Restart, Syntax / Wild Card Characters, Optical Fibre (Fibre Optics), Net Meeting, UPS, Printing Speed (CPS, CPM, LPM, DPI, PPM) Peripherals

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TEXT BOOKS

1. Computer Fundamentals By P.K.Sinha
2. Fundamental of IT for BCA By S.Jaiswal Engineering Physics

REFERENCE BOOKS

1. By V.K.Gaur 4 Teach Yourself Assembler By Goodwin. Web site References

WEB REFERENCES

1. https://www.javatpoint.com/computer-fundamentals-tutorial
2. https://www.tutorialspoint.com/computer_fundamentals/index.htm
3. https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf
4. http://www.kvadilabad.org/admin/downloads/1788662251computer_fundamentals_tutorial.pdf

BCA-103E	PROBLEM SOLVING USING C	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To introduce the students the basic of C and Logic behind the implementation of different features of C like different data types, function, array, control statements, pointers, structures, file processing and recursion.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: To know the different programming languages

CO2: To learn the basic concepts of C programming language

CO3: To learn the concepts of different control statements

CO4: To know about different data types and the ways of handling

CO5: To store the data in a file type and how to maintain it

UNIT I

COMPUTER FUNDAMENTALS AND OVERVIEW OF C PROGRAMMING: Computer Fundamentals: Algorithm, Flow charts and their symbols. Types of programming languages (Machine Language, Assembly Languages, High level Languages), Introduction to Compiler, Assembler, and Interpreter, Introduction to C, History of C Structure of C program, C character set, Identifier and Keywords, format specifiers, Data types, constants, variables, Declaration, expressions, Types of operators, Input and output functions in C, header files, Structure of C program

UNIT II

CONTROL STATEMENTS: Control Statements & loops: Sequencing, Selection: if, If-Else, Nesting and switch statements, Iteration: for loop, while loop, do while loop, break, continue and break statements, Recursion.

UNIT III

ARRAYS AND STRING HANDLING: Introduction to array, Declaring, Referencing and initializing arrays, array subscript, Types of Array, using for loop for sequential access, Using array element as a function argument, String basics, string library functions, assignment and substring, concatenation, string comparison.

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UNIT IV

FUNCTION AND POINTERS: Defining a function, accessing a function, function prototypes, passing arguments to a function, call by value and call by reference, Types of storage classes, Scope of variable: Global, local, static variables, Pointer variables, Declaring & initializing pointers, operations on pointers, pointer expressions, pointers and arrays, pointer and functions, C's dynamic allocation functions.

UNIT V

STRUCTURE, UNION AND FILE PROCESSING: Declaration and Initialization of structure, accessing members of a structure, Union, Pre-processor directives, file processing: Introduction, streams and file types, opening and closing a data file, input and output operations, text mode versus binary mode, formatted input output operations with files, structures read and write in files

TEXT BOOK

1. Computer Fundamentals, P.K Sinha, 5th Edition, BPB Publications.
2. Yashwant kanitkar," Let Us C", by BPB Publication.

REFERENCE BOOKS

1. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language, Prentice Hall of India, 2nd Edition, 1988
2. Hanly Jeri R, & E. B. Koffman , "Problem Solving and Program Design in C", Pearson Publication, 5th Edition, 2008.
3. Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
4. E.Balagurusamy "C – programming" Tata McGray Hill.
5. Schildt, Herbert "The Complete Reference C", 4th Edition, Tata McGraw Hill, 2004

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EC-108	DIGITAL ELECTRONICS	L T P	CR
		3 0 0	3

OBJECTIVE

Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

CO2: To understand and examine the structure of various number systems and its application in digital design.

CO3: The ability to understand, analyze and design various combinational and sequential circuits.

CO4: Ability to identify basic requirements for a design application and propose a cost effective solution.

CO5: The ability to identify and prevent various hazards and timing problems in a digital design.

UNIT I

INTRODUCTION OF GATES, COMBINATIONAL DESIGN BY USING GATES AND SIMPLIFICATION: Digital signal; logic gates: AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR; Boolean algebra. Review of Number systems. Binary codes: BCD; Excess- 3; Gray; EBCDIC; ASCII; Error detection and correction codes; Design using gates; Karnaugh map and Quine Mcluskey methods of simplification.

UNIT II

COMBINATIONAL DESIGN USING MSI DEVICES: Multiplexers and Demultiplexers and their use as logic elements; Decoders; Adders/Subtractors; BCD arithmetic circuits; Encoders; Decoders/Drivers for display devices.

UNIT III

SEQUENTIAL CIRCUITS: Flip Flops : S-R; J-K; T; D; master-slave; edge triggered; shift registers; sequence generators; Counters; Asynchronous and Synchronous Ring counters and Johnson Counter; Design of Synchronous and Asynchronous sequential circuits.

UNIT IV

DIGITAL LOGIC FAMILIES: Bipolar logic families: RTL; DTL; DCTL; HTL; TTL; ECL; MOS; and CMOS logic families. Tristate logic; Interfacing of CMOS and TTL families.

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UNIT V

A/D AND D/A CONVERTERS & PLD: Sample and hold circuit; weighted resistor and R - 2 R ladder D/A Converters; specifications for D/A converters. A/D converters: successive approximation; counting type; ROM; PLA; PAL; FPGA and CPLDs.

TEXT BOOK

1. Jain, R.P., "Modern Digital Electronics", 4th Ed.; Tata McGraw Hill, 2003

REFERENCE BOOKS

1. Taub and Schilling, "Digital Integrated Electronics" Tata McGraw Hill,1997
2. Malvino and Leach; "Digital Principles and Applications", 6th Edition, Tata McGraw Hill, 2006
3. Mano, Morris, "Digital Design", 3rd Edition, Prentice Hall of India,1994
4. Gupta and Singhal, "Digital Electronics", 2nd Edition, Dhanpat Rai and Sons, 2000.
5. Wakerly, John F, "Digital Design Principles and Practices", 4th Edition, Prentice Hall of India,2005

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BS-117	COMPUTATION MATHEMATICS-I	L T P	Cr
		3 0 0	3

OBJECTIVE

The objective of this subject is to understand the major problems of differential and integral calculus and to appreciate how calculus allows us to solve important practical problems in an optimal way.

PRE-REQUISITES: Knowledge of Basic Mathematics

COURSE OUTCOMES

CO1: Calculate limits, derivatives and indefinite integrals of various algebraic and trigonometric functions of a single variable.

CO2: Use the fact that the derivative is the slop of the tangent line to the curve at a given Point.

CO3: Use the properties of limits and the derivative to analyze graphs of various functions of a single variable

CO4: Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life Sciences and a host of other disciplines.

UNIT I

LIMIT & CONTINUITY*: The* real line and its geometrical representation; *e-δ* treatment of limit and continuity; Properties of limit and classification of discontinuities; Properties of continuous functions.

UNIT II

MATRICES AND ITS APPLICATIONS: Elementary transformations; inverse of the matrix using elementary transformation; normal form of a matrix; rank of a matrix; solution of simultaneous linear equations; linear dependence and independence of vectors; linear and orthogonal transformations; eigen values, eigen vectors and properties; Cayley-Hamilton theorem and its applications; diagonalization of matrices.

UNIT III

INFINITE SERIES: Convergence and divergence; comparison test; D'Alembert's ratio test; Cauchy's root test; Raabe's test; logarithmic test; Gauss test; Cauchy's integral test; Leibnitz's alternate series test; absolutely convergent; conditionally convergent.

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UNIT IV

APPLICATIONS OF DIFFERENTIATION & PARTIAL DIFFERENTIATION: Asymptotes; Concavity, convexity and points of inflection; Curvature; Extrema; elementry curves, tangent and normal in parametric form; Polar Coordinates. Limits and continuity of functions of two variables; Partial derivatives; Taylor's theorem and Maclaurin's Theorem for function of two variable.

UNIT V

MULTIPLE INTEGRATIONS: Double and triple integrals; Change of order in double integrals. Application of Integration: length of a curve; Arc length as a parameter; Evoute & Envelope; Volumes and surface areas of solids of revolution.

TEXT BOOK:

1. Grewal, B.S., "Higher Engineering Mathematics", 41st Edition,2010,Khanna Publishers.
2. Kreyszig, E., "Advance Engineering Mathematics", 10th Edition, 2011,Wiley India Publishers, New Delhi

REFERENCE BOOKS

1. Weir, M. D., Hass, J. and Giordano, F. R., "Thomas Calculus", 11th Edition, 2012, Pearson Education.
2. Jain, R.K. and Iyengar, S.R.K., " Advance Engineering Mathematics" ,3rd Edition,2002, Narosa Publishing House New Delhi.
3. H. Anton, I. Bivens and S. Davis, *Calculus,* 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
4. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005

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HSS-107	ENGLISH & COMMUNICATION SKILLS	L-T-P	Cr.
		3-0-0	3

OBJECTIVE

To make students understand the concepts related to language development communication skills.

COURSE OUTCOMES

The students undergoing the course will be able:

CO1: To know the basic structure of speech

CO2: To learn about oral communication and role of speech organs in it

CO3: To get knowledge about the writing skills

CO4: To be skillful in writing different applications as well as letters

CO5: To know all about comprehension

UNIT I

REMEDIAL ENGLIGH: Parts of Speech; Tenses and their application; Verbs and their various forms.

UNIT II

ORAL COMMUNICATION: Introduction to oral communication; Importance of pronunciation; Phonetics; Importance of phonetics; Basic introduction to speech organs, articulation and phonetic symbols.

UNIT III

WRITING SKILLS: Introduction to various types of writings including general writing, technical writing, picture composition, Slogan making; Movie review etc.

UNIT IV

LETTER WRITING: Types of letter writing; Structure & layout; Leave application; Letter of enquiry & response with respect to educational & official matters; Informal letter expressing or discussing social or educational issues.

UNIT V

COMPREHENSION: Listening comprehension & reading comprehension; Listening to recorded speeches, TV news and other audio materials to test listening comprehension; comprehension of unseen passages through reading.

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TEXT BOOK:

1. Pal Rajendra, Korlaha, Hi, J,S., “Essentials of Business Communication”, Sultan Chand & Sons

REFERENCE BOOKS

1. Rutherford, Andrea, J., “Basic Communication Skills for Technology”, Pearson Education Asia.
2. Prasad, V., “Advanced Communication Skills”, Atma Ram Publications, New Delhi.
3. Madhukar, R., K, “Business Communication”, Vikas Publishing House Pvt. Ltd.

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BCA-105E	INTERNET AND WEB DEVELOPMENT	L-T-P	Cr
		3-0-0	3

OBJECTIVES

It aims to provide students will be familiarized with Internet Structure and with the basic protocols which provides knowledge of a proficiency in basic techniques for the development of Web-based applications.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know about the web and web hosting

CO2: To create their own website using HTML

CO3: To learn to make the dynamic website using CSS

CO4: To understand the client side programming using JavaScript

CO5: To aware about the search engine and its optimization

UNIT I

INTRODUCTION TO WEB AND HOSTING: The idea of hypertext and hyper media; how the browser works: MIME types, plug-ins and helper applications; XML, XHTML, XSLT and the W3C,Hosting and Domains: Choosing a domain name, Selecting a hosting company ,Blog hosting services and how they could work for your website; Hosting management tools through the browser such as cPanel.

UNIT II

HYPERTEXT MARKUP LANGUAGE: The anatomy of an HTML document; marking up for structure and style: ordered and unordered lists, Structuring content with HTML using natural divisions , Marquee, Anchor Tag, Email Link; embedding images and controlling appearance, table creation: Frames and Nesting, iframes, forms, Semantic elements of HTML5, HTML5 Form elements, Media tags in HTML5, HTML5 Data Storage

UNIT III

POWER OF CSS: Introduction to Cascading Style Sheet: Selector, Declaration and declaration block. Types of CSS: Inline, Internal and Internal style specifications within HTML. Types of Selector; Building & Applying Class Selectors; ID Selector using Div Tags; CSS Properties: Table, List, Fonts, Link, Margins, Background Colors.

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UNIT IV

CLIENT SIDE PROGRAMMING: Introduction to JavaScript syntax: output, Comments, variables, functions, operators, conditions, switch, loop; JavaScript object model: Window, Location and History object model; HTML DOM: Introduction to DOM: methods, event handling, JavaScript Functions, Forms validation and regular expressions.

UNIT V

SEARCH ENGINE OPTIMIZATION: What is Search Engine Optimization? Natural vs. paid search and a look at how Google and other search engines work. Maximizing natural search with page titles, meta tags and page content; importance of inbound links in search rankings. Search engine marketing.

Textbook:

Uttam K. Roy, "Web Technology", Oxford Publication

References Books:

1. Musciano Chuck, "HTML & XHTML: The Definitive Guide", Bill Kennedy, 4th Edition, 2000.

2. Holzner Steven, "XHTML Black Book", Paraglyph Press, 2000.

3. Guy W.Lecky-Thompson, "Web Programmin", Cengage Learning, 2008.

4. Kamal Raj, "Internet and Web Technologies", Tata McGraw Hill, 2002

Web References:

1. http://W3schools.com.
2. http://www.uniweb.be/
3. http://www.sagaciousindia.com/

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BCA-107E	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	L-T-P	Cr
		3-0-0	3

OBJECTIVES

- Know about the basic building block of Artificial Intelligence.
- Explain the concept of machine thinking.
- Describe the evolution of AI and modern concepts and Programming platforms for AI.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Discuss about the basic principle of AI

CO2: Analyse the concept of machine thinking.

CO3: Understanding the modern concept in AI.

UNIT I

INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI):

What is Artificial Intelligence (AI)? Brief history of AI. Intelligence and artificial intelligence. Elements of Intelligence – Reasoning, Learning, Problem Solving, Perception, Linguistic Intelligence. Coming together of cognition, philosophy, math, linguistics, control theory and computer science. Introduction to agent-Agent performance –Example of Agents-Agent Faculties .

UNIT II

PHILOSOPHY OF AI:

Can machine think? 'Turning and testing-The Chinese room. Computation and representation-Applications eras of AI-Computationalism-Ethics of AI-Impacts of AI, Limitations and possibilities of AI, Concerns about AI, AI and the future.

UNIT III

INTELLIGENT SYSTEM:

What is intelligence? Structure of intelligent system-Biological brain -Basic neural model-Intelligent Agents- Rationality- Agent Environment- Agent architectures-the concept of rationality-The structure of agent-The impact of AI in human labor-AI and the social equality.

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TEXT BOOKS

1. "Artificial Intelligence a Modern Approach", by Stuart J. Russell and Peter Norvig, Second Edition, Pearson Education, Inc., Upper Saddle River; New Jersey 07458.
2. "Artificial Intelligence: The Basics", by Kevin Warwick, Professor of Cybernetics Kevin, first published 2012 by Routledge.
3. "Artificial intelligence A systems approach", by M. Tim Jones, INFINITY SCIENCE PRESS LLC, 2008.

REFERENCE BOOKS

1. "Artificial Intelligence: Foundations of Computational Agents", by D. Poole, Cambridge University Press, 2010.
2. "Artificial Intelligence and Intelligent Systems", by Padhy N.P, 4th impression, Oxford University Press, 2007.

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BCA-153E	PROBLEM SOLVING USUNG C LAB	L-T-P	Cr.
		0-0-2	1

OBJECTIVE

To implement different aspects of C Language using different control statements and loops as well as different storage structures like arrays, strings and files.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: To implement the different control statements like sequential, conditional & loops

CO2: To learn the basic concepts of C programming language

CO3: To learn the concepts of different control statements

CO4: To know about different data types and the ways of handling

CO5: To store the data in a file type and how to maintain it

List of Experiments

BASIC

1. Write a program to print HELLO.
2. Write a program to add two numbers.
3. Write a program to calculate simple interest.
4. Write a program to calculate average of three numbers.
5. Write a program to illustrate mixed data types.
6. Write a program to find factorial of a number.
7. Write a program to print table of any number.
8. Write a program to enter the elements in a one-dimensional array.
9. Write a program to find the sum and average of five numbers.
10. Write a program to enter the marks of 50 students and calculate the average.
11. Write a program to calculate the length of string.
12. Write a program to concatenate 2 strings.
13. Write a program to reverse the string.
14. Write a program without using predefined functions to check whether the string is palindrome or not.
15. Write a program using function to find the largest of three numbers.
16. Write a program using function to swap two numbers using call by value.
17. Write a program using function to swap two numbers using call by reference.
18. Write a program using function to sum the digits of a number.
19. Write a program to illustrate the concept of chain of pointers.
20. Write a program to read an employee record using structure and print it.

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MODERATE

1. Write a program to swap two numbers
2. Write a program to calculate area and circumference of circle.
3. Write a program to add digits of a four-digit number.
4. Write a program to find greatest of two numbers.
5. Write a program to sort the array elements.
6. Write a program to add 2 matrices.
7. Write a program to count the numbers of characters in a string.
8. Write a program to calculate factorial of a number using recursive function.
9. Write a program to calculate the area and perimeter of circle using pointers.

ADVANCE

1. Write a program to swap two numbers without using third variable.
2. Write a program to evaluate a polynomial expression.
3. Write a program to make a basic calculator.
4. Write a program to print Fibonacci up to the given limit.
5. Write a program to multiply 2 matrices.
6. Write a program that converts lower case characters to upper case.
7. Write a program to prepare salary chart of employee using array of structures.

PROJECT

1. Write a program to implement TIC-TAC-TOE game.

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EC-158	DIGITAL ELECTRONICS LAB	L T P	Cr
		0-0-2	1

OBJECTIVE

Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing.

COURSE OUTCOMES

CO1: Verify the theoretical characteristics of diodes, transistors, OP-amps and digital electronic components experimentally

CO2: Implement and analyze various circuits viz. Rectifiers, Voltage Regulators, Amplifier circuits, Op-Amp based linear & non-linear circuits

CO3: Design Op-amp based circuits and Combinational and Sequential logic circuits.

LIST OF EXPERIMENTS

Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi – meter, oscilloscope. Resistors, capacitors and inductors.

1. To study V-I characteristics of diode; and its use as a capacitance.
2. Study of the characteristics of transistor in Common Base configuration.
3. Study of the characteristics of transistor in Common Emitter configuration.
4. Study of characteristics of MOSFET/JFET is CS configuration.
5. To verify the Thevenin's & Norton's theorem.
6. To verify the Superposition theorem.
7. To study frequency response of series & parallel RLC Circuit.
8. Demonstration of cut – out sections of machines:
9. Load test on D.C. Shunt generator

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BCA-155E	INTERNET AND WEB DEVELOPMENT LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE:

It aims to make students to make them skillful in creating and handling web based applications like websites etc.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know and use different HTML tags

CO2: To create different lists in a webpage or website

CO3: To create their own website

CO4: To learn to make the dynamic website using CSS

CO5: To understand the client side programming using Javascript

List of Practicals

1. Design a web page using: Physical and Logical tags of HTML.
2. Design a web page using
   2.2 Ordered List
   2.3 Unordered Lists
   2.4 Nested Lists
3. Design a web page to show the use of image as a hyperlink.
4. Design a web-page using frames and linking.
5. Code to create a bookmark.
6. Design a web-page showing the use of forms using HTML 4.01 and HTML 5 Tags.
7. Design a page using basic tags of HTML 5.0.
8. Design a web-page using style sheets (External, Internal and Inline)
9. Write a Program to print if the no is even or odd using JavaScript.
10. Input a number and find the difference of the sum of factors and non-factors.
11. WAP in JavaScript to print the pattern
    12345
    1234
    123
    12
    1
12. WAP to Accept an Array of 10 numbers and display the sum of elements.
13. WAP to find greatest of all elements of an array.
14. Design a web-page to show different validation checking using Java Script.
15. WAP in PHP code for calculating S.I.
16. WAP to Calculate factorial of a number.
17. WAP to print the table of 10.

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18. WAP to print the sum of diagonal elements.
19. WAP to enter 5

BCA-102E	OPERATING SYSTEM	L T P	Cr
		3-0-0	3

OBJECTIVE

To provide the knowledge of internals, different types and purpose of operating systems

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To get familiar with the basic concepts of operating system

CO2: To know about the multiprocessing, synchronization & deadlocks

CO3: To learn the strategy to manage the memory available

CO4: To learn the concepts of files, their accession and disk scheduling

CO5: To know about the hardware devices and drivers used for them

UNIT I

PROCESS MANAGEMENT: Functionalities and Objectives of OS, historical evolution of operating systems, types of operating system, O/S service system calls, system programs, Process States, Process Control Block, Processor Scheduling, CPU scheduling, scheduling criteria, scheduling algorithms

UNIT II

PROCESS-SYNCHRONIZATION & DEADLOCKS: Critical Section; Mutual exclusion, Process cooperation,; Deadlocks: deadlock prevention; avoidance and detection; deadlock recovery;: Dining philosophers problem; semaphores.

UNIT III

MEMORY MANAGEMENT: Logical & Physical Address Space; swapping; contiguous memory allocation; non-contiguous memory allocation paging and segmentation techniques; segmentation with paging; virtual memory management - Demand Paging & Page-Replacement Algorithms;.

UNIT IV

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FILE SYSTEM: Different types of files and their access methods; directory structures; various allocation methods; disk scheduling and management.

UNIT V

I/O SYSTEMS: I/O Hardware; Device Controllers; Interrupt Handlers; Device Drivers; Application I/O Interface; Kernel; Transforming I/O requests; Performance Issues.

TEXT BOOK

Silberchatz et al, ―Operating System Concepts‖, 5th edition, Addison-Wesley, 1998

REFERENCE BOOKS

1. Tanenbaum A., ―Modern Operating Systems‖, Prentice-Hall, 1992
2. Stallings William, ―Operating Systems Internals and Design P rinciples‖ , 4th edition, Prentice-Hall, 2001
3. Dhamdhere D. M., ―Operating System‖, 2nd Edition, Tata McGraw Hill, 1999
4. Kernighan Brian and Pike Rob, ―The Unix Programming Environment‖, Prentice Hall of India, 1984
5. Bach Maurich, ―Design of the Unix Operating System ‖, Prentice Hall of India, 1986
6. Muster John, ―Introduction to UNIX and LINUX‖, Tata McGraw Hill, 2003
7. Ritchie Colin, ―Operating System Incorporating Unix & Windows‖, Tata McGraw Hill, 1974
8. Madnick Stuart and Donovan John, ―Operating Systems‖, Tata McGraw Hill, 2001

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BCA-104E	DATABASE MANAGEMENT SYSTEM	L-T-P	Cr
		3-0-0	3

OBJECTIVES

To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of database & its architecture

CO2: To aware about the existing data models, entities as well as constraints

CO3: To learn about the different anomalies of the data and ways to normalize it

CO4: To know about the storage of data in the files & organization of files

CO5: To learn about the transactions and its ways done on the database

UNIT I

INTRODUCTION: Purpose of database system; characteristics of database approach; advantages of using DBMS; database concept and architecture; data abstraction, data models; instances and schema; data independence; schema architecture; database languages; database manager; database administrator; database users.

UNIT II

DATA MODELING: Introduction to Hierarchical model, Network model. Relational model, E-R Model, Entity sets attributes and keys; relationships (ER); database modelling using entity; type role and structural constraints; weak and strong entity types; entity-relationship diagram-basic concepts; Enforcing Data Integrity Constraints; Relational-Algebra Operations; Introduction on views; Codd's Rules.

UNIT III

NORMALIZATION& SQL: Database design process; relational database design; relation schema; anomalies in a database; functional dependencies; 1NF, 2NF, 3NF and BCNF. ; Reduction of an E-R schema to Tables; Introduction to SQL; basic queries in SQL; advanced queries in SQL; functions in SQL; basic data retrieval; updates in SQLs, views in SQL.

UNIT IV

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FILE ORGANIZATION: indexing and hashing; overview of file organization techniques; secondary storage devices; operations in files; heap files and sorted files; ; Indexing and Hashing- Basic concepts; Static Hashing; Dynamic Hashing; ordered indices; single level ordered index; multi-level index.

UNIT V

TRANSACTION PROCESSING & QUERY PROCESSING: Desirable properties of transactions; implementation of atomicity and durability; schedules and recoverability; serializability of schedules; concurrency control. Deadlock handling - detection and resolution.

TEXT BOOK

1. Silberschatz A., Korth H. F. and Sudarshan S., "Database System Concepts", 3rd edition, McGraw-Hill, International Edition, 1997

REFERENCE BOOKS

1. Date C. J., "An Introduction to Database Systems", 7th edition, Addison- Wesley, Low Priced Edition, 2000 .

2. Desai Bipin, "Introduction to Database Management System", Galgotia Publications, 1991

3. Elmasri R. and Navathe S. B., "Fundamentals of Database Systems", 3rd edition, Addison-Wesley, Low Priced Edition, 2000

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BCA-106E	DATA STRUCTURE USING C++	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To relay the theoretical and fundamental knowledge of most commonly used Data Structures.

COURSE OUTCOMES

CO1: Understand the concept of data structures, algorithms, time and space complexity.

CO2: Understand basic data structures such as arrays and linked lists.

CO3: Describe the data structures such as stacks and queues.

CO4: Solve problems involving graphs and trees.

CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

UNIT I

INTRODUCTION TO DATA STRUCTURES: Definition of data structure, data structure operations. Algorithms: Complexity, Time Space tradeoff, Complexity of Algorithms, Asymptotic Notations for Complexity of Algorithms, Variables.

UNIT II

ARRAYS AND LINKED LISTS: Introduction, Linear arrays, Representation of linear arrays in memory, Address calculation of using row and column major ordering, Traversing linear arrays, Inserting and Deleting, Multidimensional arrays, Linked Lists, Representation of Linear Lists in memory, Traversing a Linked List, Searching a linked List, Insertion into a linked list, Deletion from linked list, Circular linked lists, Doubly linked lists, Header linked lists, Memory allocation: Garbage collection, overflow and underflow.

UNIT III

STACK AND QUEUES: Stacks: Definition, Array representation of stacks, Linked representation of stacks, Polish notation, Evaluation of a Postfix Expression, Transforming Infix Expressions into Postfix Expressions, Queues: Definition, Array representation of Queues, Linked representation of Queues, Circular queues, Priority Queue, Double Ended Queue.

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UNIT IV

TREES AND GRAPHS: Definition of trees and Binary trees; Properties of Binary trees and Implementation; Binary Traversal pre-order; post order; in- order traversal; Binary Search Trees, AVL trees, Balanced trees. Definition of Undirected and Directed Graphs; The Array based implementation of graphs; Adjacency matrix; path matrix implementation; The Linked List representation of graphs; Graph Traversal – Breadth first Traversal; Depth first Traversal.

UNIT V

SORTING AND SEARCHING ALGORITHMS: Introduction; Sorting by exchange; selection; insertions; bubble sort; Merge sort; Quick sort, Heap sort; Searching Algorithms: Straight Sequential Search; Binary Search (recursive & non–recursive Algorithms).

TEXT BOOKS

1.Aho, A.V, Hopcroft, J. E., Ullman, T. D., "Data Structures and Algorithms", Original Edition, Addison-Wesley, Low Priced Edition, 1999

2. Seymour Lipchutz, "Theory and Problems of Data Structures", Tata Mc Grew

REFERENCE BOOKS

1. M. Tenenbaum, Langsam, Moshe J. Augentem, "Data Structures using C", Prentice Hall of India
2. Ellis, Horowitz, SartajSahni, "Fundamentals of Data Structures", Addison-Wesley Pub, 1983
3. Mark Allen Weiss, "Data Structures and Algorithms Analysis in C",Pearson Education, 2000

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BCA-108E	DISCRETE STRUCTURES	L T P	Cr
		3 0 0	3

OBJECTIVE

To lay mathematical foundation for the fundamentals of various computational structures such as Boolean algebra, propositional logic, graph and trees.

COURSE OUTCOMES

CO1: Perform operations on various discrete structures such as sets, functions, relations, and sequences.

CO2: Ability to solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions.

CO3: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

CO4: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

CO5: Understand the various properties of algebraic systems like Rings, Monoids and Groups.

UNIT I

SET THEORY: Introduction to set theory; set operations; algebra of sets: duality, finite and Infinite sets, classes of sets, power sets, multi sets, Cartesian product, representation of relations, Types of relation, equivalence relations and partitions, partial ordering relations and lattices; Function and its types, composition of function and relations; cardinality and inverse relations

UNIT II

PROPOSITIONAL CALCULUS: Basic operations: AND (Λ), OR (V), NOT (~), truth value of a Compound statement, propositions, tautologies, contradictions.

UNIT III

TECHNIQUES OF COUNTING: Permutations with and without repetition, combination.

UNIT IV

ALGEBRIC STRUCTURES: Definition and examples of a monoid, semi group, groups and Rings; homomorphism, isomorphism and auto Orphism; subgroups and normal subgroups; cyclic groups, integral domain and fields; co-sets; Lagrange's theorem

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UNIT V

GRAPHS: Introduction to graphs, directed and undirected graphs; homomorphic and isomorphic Graphs; sub graphs; cut points and bridges; multigraph and weighted graph; paths and circuits, shortest path in weighted graphs; Eulerian path and circuits, Hamilton paths and circuits; planar Graphs; Euler's formula, Spanning tree

TEXT BOOK

Liu C. L., "Elements of Discrete Mathematics", McGraw Hill, 1989

REFERENCE BOOKS

1. Johnson Bough R., "Discrete Mathematics", 5th Edition, Pearson Education, 2001
2. Graham Ronald, Knuth Donald E. and Patashik Oren, "Concrete Mathematics: A Foundation for Computer Science", Addison-Wesley, 1989
3. Gersting Judith L., "Mathematical Structures for Computer Science", Computer Science Press, 1993
4. Chtewynd A. and Diggle P., "Discrete Mathematics", Modular Mathematics Series,Edward Arnold, London, 1995
5. Lipshutz S., "Schaums Outline series: Theory and problems of Probability", McGraw Hill Singapore,1986.
6. Kolman B. and Busby R. C., "Discrete Mathematical Structures", Prentice Hall of India, 1996
7. Trembley and Manohar, "Discrete Mathematical Structures with Applications to Computers" McGraw Hill, 1995

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BCA-110E	PYTHON PROGRAMMING	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To build programming logic and thereby developing skills in problem solving using Python programming language; To be able to do testing and debugging of code written in Python Emphasize the concepts and constructs rather than on language features.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: To learn and understand Python programming basics and paradigm.

CO2: To learn and understand python looping, control statements and string manipulations.

CO3: Students should be made familiar with the concepts of GUI controls and designing GUI applications.

CO4: To learn and know the concepts of Structure and Functions.

CO5: To learn and know the concepts of file handling, exception handling and database connectivity.

UNIT I

PLANNING THE COMPUTER PROGRAM AND PROBLEM-SOLVING TECHNIQUES: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. Flow charting, decision table, algorithms, structured programming concepts, Programming methodologies viz. Top-down and bottom-up programming.

UNIT II

OVERVIEW OF PROGRAMMING & INTRODUCTION TO PYTHON: Structure of a Python Program, Elements of Python. Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic Operator, Relation a l operator, Logical or Boolean operator, Assignment, Operator, Ternary operator ,Bit wise operator, Increment or Decrement operator).

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UNIT III

CREATING PYTHON PROGRAMS: Input and Output Statements, Control Statements(Looping- while Loop, for Loop ,Loop Control ,Conditional Statement-if...else, Difference between break ,continue and pass).

UNIT IV

STRUCTURES& FUNCTIONS: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments.

UNIT V

CLASSES, OBJECT-ORIENTED PROGRAMMING AND EXCEPTION: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding, Handling exceptions

TEXT BOOKS

John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India

REFERENCE BOOKS

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.or2010
3. Allen Downey, Jeffrey Elkner, Chris Meyers ,How to think like a computer scientist :Learning with Python,Freelyavailableonline.2012
4. http://docs.python.org/3/tutorial/index.html
5. http://interactivepython.org/courselib/static/pythonds
6. http://www.ibiblio.org/g2swap/byteofpython/read/

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BCA-112E	KNOWLEDGE REPRESENTATION AND REASONING	L-T-P	Cr
		3 0 0	3

OBJECTIVES

- Define the concepts of AI and intelligent agents and their role in problem-solving and decision-making.
- Understand different problem-solving techniques and search algorithms to find optimal solutions.
- Develop knowledge and reasoning skills to represent, manipulate, and reason with knowledge.
- Apply logical and planning techniques to develop intelligent agents capable of taking rational decisions in complex environments.
- Explore different learning approaches and techniques to build adaptive and intelligent agents.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Understand the foundations and history of AI and the role of intelligent agents in solving complex problems.

CO2: Analyze and compare different search algorithms to find optimal solutions for well-defined problems.

CO3: Design and implement knowledge-based systems using logical and rule-based representations and inference engines.

CO4: Develop planning agents capable of generating and executing plans in complex environments.

CO5: Build intelligent agents using different learning approaches, such as supervised and unsupervised learning, and reinforcement learning.

UNIT I

INTRODUCTION TO AI:

What is AI, thinking humanly, acting rationally, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, the gestation of artificial intelligence, AI becomes an industry, Knowledge-based systems, the return of neural networks, The State of the Art

Intelligent Agents, How Agents Should Act, Structure of Intelligent Agents, Simple reflex agents, Goal-based agents, Utility-based agents, Environments, Environment Programs.

UNIT II

PROBLEM-SOLVING:

Solving Problems by Searching, Problem-Solving Agents, Formulating Problems, Well-defined problems and solutions, measuring problem-solving performance, Toy problems, searching for Solutions, Search Strategies, Avoiding Repeated States, Constraint Satisfaction Search

Informed Search Methods, Best-First Search, Heuristic Functions, Memory Bounded Search, Iterative Improvement Algorithms, and Applications in constraint satisfaction problems.

UNIT III

KNOWLEDGE AND REASONING:

A Knowledge-Based Agent, Representation, Reasoning, and Logic, Prepositional Logic, An Agent for the Wumpus World, Problems with the propositional agent, First-Order Logic, Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic, A Simple Reflex Agent, Deducing Hidden Properties of the World, Toward a Goal-Based Agent

Building a Knowledge Base, Knowledge Engineering, General Ontology, The Grocery Shopping World, Inference Rules Involving Quantifiers, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution: A Complete Inference Procedure, Completeness of resolution

UNIT IV

ACTING LOGICALLY:

A Simple Planning Agent, From Problem Solving to Planning, Planning in Situation Calculus, Basic Representations for Planning, A Partial-Order Planning Algorithm, Planning with Partially Instantiated Operators, Knowledge Engineering for Planning,

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Practical Planners, Hierarchical Decomposition, Analysis of Hierarchical Decomposition, More Expressive Operator Descriptions, Resource Constraints, Planning and Acting, Conditional Planning, A Simple Re-planning Agent, Fully Integrated Planning and Execution

UNIT V

LEARNING AGENTS:

A General Model of Learning Agents, Components of the performance element, Representation of the components, Inductive Learning, Learning Decision Trees, Using Information Theory, Learning General Logical Descriptions, Computational Learning Theory, Learning in Neural and Belief Networks, Neural Networks, Perceptrons, Multilayer Feed-Forward Networks, Applications of Neural Networks, Bayesian Methods for Learning Belief Networks

Reinforcement Learning, Passive Learning in a Known Environment, Passive Learning in an Unknown Environment, Generalization in Reinforcement Learning, Genetic Algorithms and Evolutionary Programming, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOKS

1. Artificial Intelligence, A Modern Approach, Stuart J. Russell and Peter Norvig https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern-approach.9780131038059.25368.pdf

REFERENCE BOOKS

1. Artificial Intelligence: A Modern Approach, 4th US ed
2. AI and Machine Learning for Coders: A Programsmer's Guide to Artificial Intelligence (Grayscale Indian Edition) Paperback – 25 October 2020

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CE-108	ENVIRONMENTAL SCIENCE & ECOLOGY	L T P	CR
		3-0-0	3

OBJECTIVES

- The aim of the course is to make everyone aware of environment issues like continuing problems of pollution, loss of forest, solid waste disposal and degradation of environment.
- Issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity are other serious concerns before the mankind.

COURSE OUTCOMES

CO1: Conceptualize the processes and various factors involved in the formation of environment.

CO2: Recognize the importance of environment and the sustainable of natural resources.

CO3: Analyze interaction between social and environmental processes.

CO4: Use scientific reasoning to identify and understand environment problems and evaluate potential solutions.

CO5: Visualize the impacts of human activities on environment and role of society in these impacts.

UNIT I

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, scope and importance, Need for public awareness, Environment Impact Assessment.

UNIT II

NATURAL RESOURCES- RENEWABLE AND NON-RENEWABLE RESOURCES:

A. Natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- sMineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and
- overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water
- logging, salinity, case studies.
- Energy resources: Growing energy needs, renewable and non-renewable energy
- sources, use of alternate energy sources, case studies.

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- Land resources: Land as a resource, land degradation, man induced landslides,
- soil erosion and desertification.

B. Role of an individual in conservation of natural resources.
C. Equitable use of resources for sustainable lifestyles.

UNIT III

ECOSYSTEMS

A. Concept of an ecosystem
B. Structure and function of an ecosystem
C. Producers, consumers and decomposers
D. Energy flow in the ecosystem
E. Ecological succession
F. Food chains, food webs and ecological pyramids
G. Introduction, types, characteristic features, structure and function of the following ecosystem:
   - Forest ecosystem
   - Grassland ecosystem
   - Desert ecosystem
   - Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).

UNIT IV

BIODIVERSITY AND ITS CONSERVATIONS

A. Introduction – Definition: genetic, species and ecosystem diversity
B. Biogeographical classification of India
C. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values.
D. Biodiversity at global, national and local levels
E. India as a mega-diversity nation
F. Hot-spots of biodiversity
G. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
H. Endangered and endemic species of India
I. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT V

ENVIRONMENTAL POLLUTION

A. Definition
B. Causes, effects and control measures of:
   - Air pollution
   - Water pollution
   - Soil pollution
   - Marine pollution
   - Noise pollution
   - Thermal pollution
   - Nuclear pollution

C. Solid waste management: Causes, effects and control measures of urban and industrial wastes.
D. Role of an individual in prevention of pollution
E. Pollution case studies

Disaster management: floods, earthquake, cyclone and landslides

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BCA-160E	PYTHON PROGRAMMING LAB	L T P	Cr
		0 0 2	1

OBJECTIVE

To build programming logic and thereby developing skills in problem solving using Python programming language; To be able to do testing and debugging of code written in Python Emphasize the concepts and constructs rather than on language features.

COURSE OUTCOMES

CO1 Define and demonstrate the use of built-in data structures “lists” and “dictionary”.
CO2 Design and implement a program to solve a real-world problem
CO3 Design and implement GUI application and how to handle exceptions and files.
CO4 Make database connectivity in python programming language.

List of Experiments:

1) Installing Python: Install Python on your computer and test that it is working correctly by opening the Python interpreter and executing some basic commands.

a) Using an IDE: Install and use an integrated development environment (IDE) such as PyCharm or Visual Studio Code. Create a new Python project, write some code, and execute it.

b) Basic Python Operations: Write a Python program to print "Hello World!" on the screen. Write a program to perform basic arithmetic operations such as addition, subtraction, multiplication, and division.

2) Data Types: Crete a Student Grade Tracker system using python that uses various data types such as strings, integers, floats, booleans, lists, and dictionaries to implement these functionalities.

3) Write a program that prompts the user to enter a number, and then prints "Positive" if the number is greater than zero, "Negative" if the number is less than zero, and "Zero" if the number is equal to zero.

4) Write a program that prompts the user to enter a password. If the password is "password123", the program should print "Access granted". Otherwise, the program should print "Access denied".

5) Write a program that prompts the user to enter a number, and then prints the factorial of that number using a while loop.

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6) a) Write a program that prints the first 10 numbers of the Fibonacci sequence using a for loop.

b) Write a program that prompts the user to enter a string, and then prints each character of the string on a separate line using a for loop.

c) Write a program that prints the first 10 even numbers using a while loop.

7) Write a program that prompts the user to enter two numbers, and then prints the larger number using a conditional expression.

8) Write a program that prompts the user to enter a number, and then prints "Positive" if the number is greater than zero, "Negative" if the number is less than zero, and "Zero" if the number is equal to zero, using a conditional expression.

9) Creating and using classes and objects:

a) Create a class for a car with instance variables for make, model, and year

b) Create an object for a car and set its make, model, and year

c) Print the car's details using its instance variables

10) i) File Handling Objectives Tasks:

a) Create a new text file and write some text to it.

b) Open the file in read mode and display its contents.

c) Open the file in append mode and add some more text to it.

d) Open the file in write mode and overwrite its contents with new text.

ii) Reading and Writing Text Files Objectives:

a) Read a text file line by line and display each line.

b) Write text to a new text file line by line.

c) Append text to an existing text file.

d) Use the 'with' statement to open a file and read its contents.

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e) Use the 'with' statement to open a file and write text to it

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BCA-156E	DATA STRUCTURE USING C++ LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE
To relay the theoretical and fundamental knowledge of most commonly used Data Structures.

COURSE OUTCOMES
CO1 Be able to design and analyze the time and space efficiency of the data structure
CO2 Be capable to identity the appropriate data structure for given problem
CO3 Have practical knowledge on the applications of data structures

LIST OF EXPERIMENTS/EXERCISES

1. Write a program to search an element in an array using linear search.
2. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
3. Write a program to perform following operations on matrices using functions only
   a) Addition
   b) Subtraction
   c) Multiplication
   d) Transpose
4. Write a program for static implementation of Stack
5. Write a program for static implementation of Queue
6. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the link list
7. Write a program to create a linked list & perform operations such as insert, delete in the Circular link list
8. Write a program to implement binary search tree. (Insertion and Deletion in Binary Search Tree)
9. Write a program which simulates the various tree traversal algorithms.
10. Write a program to implement bubble sort
11. Write a program to implement selection sort
12. Write a program to implement insertion sort
13. Write a program to implement quick sort
14. Write program to implement merge sort

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BCA-154E	DATABASE MANAGEMENT SYSTEM LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVES

To provide knowledge about implementation of practical aspects of database i.e. creation of tables and applying queries using SQL queries

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of structured query language

CO2: To aware about applying different queries on database structured in the form of tables

CO3: To learn about the different SQL queries performed using operators as well as constraints

CO4: To create views from created table to further organize the data

CO5: To learn about the basic operations of relational algebra

LIST OF EXPERIMENTS/EXERCISES

1. Introduction to SQL.
2. Write a query for:
   (i) Creation of table.
   (ii) Insertion of data into table
   (iii) Displaying the data of table.
   (iv) Deletion of data from table
   (v) Updating the data
   (vi) Modifying the structure of a table.
3. Finding unique names of all salesmen, deletion of the structure of a table, use of delete command with conditions, updating records of a table with conditions, altering structure of a table and changing size of existing column in the table
4. Arithmetic operators, logical operators and pattern matching operator.
5. Key constraints: primary key constraints, foreign key constraints, not null constraints and unique constraints; use of check constraints.
6. Aggregate and mathematical functions: count, count(*), Avg, max, min, sum, lower, upper, power , sqrt.
7. Creating views from single and multiple tables, drop views and creating index on the table and drop them.
8. Binary operations in Relational Algebra: Union, Intersection, Set Difference, Join, Cartesian product.
9. Grouping of data into tables and listing records in ascending order or descending order.
10. Creation of sequences and explain use of sequences.

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11. Access permissions in SQL.

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BCA-192E	CODING AND COMPUTATIONAL THINKING – I	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To implement different aspects of C Language using different control statements and loops as well as different storage structures like arrays, strings and files.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: To implement the different control statements like sequential, conditional & loops

CO2: To learn the basic concepts of C programming language

CO3: To learn the concepts of different control statements

CO4: To know about different data types and the ways of handling

CO5: To store the data in a file type and how to maintain it

List of Experiments

SEQUENTIAL CONTROL STATEMENTS

1. Write a program to Print HELLO
2. Write a program to add two numbers
3. Write a program to calculate simple interest
4. Write a program to calculate average of three numbers
5. Write a program to swap two numbers
6. Write a program to illustrate mixed data types
7. Write a program to calculate area and circumference of circle
8. Write a program to evaluate a polynomial expression
9. Write a program to add digits of a four digit number
10. Write a program to check whether the person if eligible for voting or not

CONDITIONAL CONTROL STATEMENTS

11. Write a program to find gratest of two numbers
12. Write a program to find out which type of triangle it is
13. Write a program to find out greatest of three numbers
14. Write a program to evaluate performance of the student
15. W*rite a program to make a basic calculator

LOOP CONTROL STATEMENTS

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16. Write a program to print fibonacci upto the given limit
17. Write a program to find the sum of digits of a number
18. Write a program to find factorial of a number
19. Write a program to print table of any number

ARRAYS AND STRINGS

20. Write a program to enter the elements in a one dimensional array
21. Write a program to find the sum and average of five numbers
22. Write a program to sort the array elements
23. Write a program to enter the marks of 50 students an calculate the average
24. Write a program to add 2 matrix
25. Write a program to multiply 2 matrices
26. Write a program to calculate the length of string
27. Write a program to concatenate 2 strings
28. Write a program to reverse the string
29. Write a program to count the numbers of characters in a string
30. Write a program that converts lower case characters to upper case
31. Write a program without using predefined functions to check weather the string is palindrome or not

FUNCTIONS

32. Write a program using function to find the largest of three numbers
33. Write a program using function to swap two numbers using call by value
34. Write a program using function to swap two numbers using call by refrence
35. Write a program using function to sum the digits of a number
36. Write a program to calculate factorial of a number using recursive function
37. Write a program to print first n fibonacci using recursive function

POINTERS

38. Write a program to illustrate the concept of chain of pointers
39. Wrie a program to calculate the area and perimeter of circle using pointers
40. Wrie a program to find largest of three numbers

STRUCTURES

41. Write a program to read an employee record using structure and print it

Write a program to prepare salary chart of employee using array of structures

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Syllabus
of
BCA(DS)
3rd Semester
&

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4th Semester

LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2025-26

School : School of Computer Applications	**Batch : 2024– 27**
Course : BCA(DATA SCIENCE)	**Year : 2nd**
	Semester : III

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-201E	Computer architecture & Organization	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-203E	Computer Networks	3	0	0	3	15	25	60	-	-	100
3	PCC	BCA-205E	Object-Oriented Programming using Java	3	0	0	3	15	25	60	-	-	100
4	PEC	BCA-DS-203E	Data Wrangling & pre-processing	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-DS-201E	Data mining & Warehousing	3	0	0	3	15	25	60	-	-	100
6	PCC	BCA-211E	Design Analysis & Algorithm	3	0	0	3	15	25	60	-	-	100
7	PCC	BCA-DS-251E	Data mining & Warehousing Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	BCA-255E	Object-Oriented Programming using Java Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-291E	Coding & Computing Thinking-II	0	0	4	2	-	-	-	60	40	100

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10	PEC	PEC-CS-201E	MOOC Course-I (NPTEL)	2	0	0	2	-	-	-	-	-	100
			Total	20	0	8	24						

LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2025-26

School : School of Computer Applications | **Batch : 2024– 27**

Year : 2nd

Course : BCA(DATA SCIENCE) | **Semester : IV**

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-202E	Software Engineering & Testing	3	1	0	4	15	25	60	-	-	100
2	PEC	ABMA-CS	Academic Basket (Preference - I)	4	0	0	4	15	25	60	-	-	100
3	PEC	ABMI-CS	Academic Basket (Preference – II)	2	0	0	2	15	25	60	-	-	100
4	PCC	BCA-206E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-DS-202E	R Programming for Data Science	3	0	0	3	15	25	60	-	-	100
6	PEC		Elective –I	3	0	0	3	15	25	60	-	-	100
7	PCC	BCA-256E	Artificial Intelligence Lab	0	0	2	1	-	-	-	60	40	100
8	PEC	BCA-DS-252E	R Programming for Data Science Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-260E	MongoDB Lab	0	0	4	2	-	-	-	60	40	100
10	PROJ	PROJ-	Minor Project	0	0	4	2	-	-	-	60	40	100

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		292E											
11	AUC	VAC-202E	Value Added Courses	0	0	0	0	-	-	-	-	-	50
			Total	18	1	12	25						

BCA-201E	COMPUTER ARCHITECTURE AND ORGANIZATION	L T P	Cr
		3-0-0	3

OBJECTIVE

To provide basic knowledge of internals of microprocessor, its architecture, components, terminologies, etc. at minute level and ultimately about the working of a digital computer hardware as a whole.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic architecture of the computer

CO2: To learn about the different addresses and instructions passed for

CO3: To know about the different types of architecture & instruction cycle

CO4: To get knowledge about the different types of memories and their hierarchies

CO5: To know about the parallel processing

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UNIT I

GENERAL SYSTEM ARCHITECTURE: k-map, number system, FF, Boolean algebra, design of logic gates. Functions and block diagram of computer, store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); multilevel viewpoint of a machine: digital logic, operating systems, high level language; structured I/O; performance metrics; MIPS, MFLOPS, GFLOPS and TFLOPS

UNIT II

INSTRUCTION SET ARCHITECTURE: Instruction codes, instruction set formats (fixed, variable, hybrid); types of instructions, memory reference, register reference, I/O reference; addressing modes: register, immediate, direct, indirect, indexed; operations in the instruction set; arithmetic

and logical, data transfer, control flow; types of interrupts; timing and control; instruction set based classification of processors (RISC, CISC, and their comparison).

UNIT III

BASIC NON PIPELINED CPU ARCHITECTURE: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, fetch-decode-execute cycle (typically 3 to 5 stage); micro-instruction formats, implementation of control unit: hardwired and micro-programmed, control memory, microinstruction sequencing.

UNIT IV

MEMORY HIERARCHY & I/O TECHNIQUES: Need for a memory hierarchy (Locality of Reference Principle, memory hierarchy in practice: cache, main memory and secondary memory, memory parameters: access/ cycle time, cost per bit); main memory (semiconductor RAM & ROM organization, memory expansion, static & dynamic memory types); cache memory: associative &direct mapped cache organizations. .Internal memory, High speed memory.

UNIT V

INTRODUCTION TO PARALLELISM: Goals of parallelism (exploitation of concurrency, throughput enhancement); Amdahl's law; instruction level parallelism (pipelining, super scaling-basic features); processor level parallelism (multiprocessor systems overview), parallel processing concept, processing power and buses of a microprocessor, components of microprocessor; I/O ports.

TEXT BOOK

1. Carpinelli, —Computer Organization & Architecture‖ Tata McGraw Hill, 2001

REFERENCE BOOKS

1. Stallings. W, —Computer Organization &Architecture: Designing For Performance‖, 6th Edition, Prentice Hall of India, 2002/ Pearson Education Asia, 2003
2. Mano M Morris, —Computer System Architecture‖, 3rd Edition, Prentice Hall of India Publication, 2001 / Pearson Education Asia, 2003
3. Rajaraman V. and Radhakrishnan T, —Introduction to Digital Computer Design‖, 4th Edition, Prentice Hall of India 2004.
4. Stalling William, —Computer Organization and Architecture‖, 7th Edition, Prentice Hall of India, 2005.

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BCA-203E	COMPUTER NETWORKS	L T P	Cr
		3-0-0	3

OBJECTIVE

To have a fundamental understanding of the design, performance and state of the art of wireless communication systems, Topics covered include state of the art wireless standards and research and thus changes substantially form one offering of this course to the next

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know different types of networks and basic architecture of network

CO2: To learn about different network models

CO3: To know deeply about the local area network

CO4: To know deeply about the wide area network

CO5: To aware about application layer of network models

UNIT I

OSI REFERENCE MODEL AND NETWORK ARCHITECTURE: Introduction to Computer Networks; Example networks ARPANET; Internet; Private Networks; Network Topologies: Bus-; Star-; Ring-; Hybrid-; Tree -; Complete -; Irregular –Topology, Types of Networks: Local Area Networks; Metropolitan Area Networks; Wide Area Networks; Layering architecture of networks; OSI model; Functions of each layer; Services and Protocols of each layer.

UNIT II

TCP/IP: Introduction; History of TCP/IP; Layers of TCP/IP; Protocols; Internet Protocol; Transmission Control Protocol; User Datagram Protocol; IP Addressing; IP address classes; Subnet Addressing; Internet Control Protocols; ARP; RARP; ICMP; Application Layer; Domain Name System; Email – SMTP; POP; IMAP; FTP; NNTP; HTTP; Overview of IP version 6.

UNIT III

LOCAL AREA NETWORKS: Introduction to LANs; Features of LANs; Components of LANs; Usage of LANs; LAN Standards; IEEE 802 standards; Channel Access Methods; Aloha; CSMA; CSMA/CD; Token Passing; Ethernet; Layer 2 & 3 switching; Fast Ethernet and Gigabit Ethernet; Token Ring; LAN interconnecting devices: Hubs; Switches; Bridges; Routers; Gateways.

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UNIT IV

WIDE AREA NETWORKS: Introduction of WANs; Routing; Congestion Control; Quality of Service, WAN Technologies; Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET); Asynchronous Transfer Mode (ATM); Frame Relay.

UNIT V

APPLICATION LAYER: Remote Logging, Electronic Mail, SMTP, POP, IMAP FTP, WWW, HTTP, SNMP, Network Security: Services, Message Confidentiality, Authentication, Integrity, Firewalls.

TEXT BOOK

1. Forouzan Behrouz A., "Data Communications and Networking", Tata McGraw Hill 2006.

REFERENCE BOOKS

1. Tanennbaum Andrew S, "Computer Networks", 4th Edition, Pearson Education/Prentice Hall of India, 2003.
2. Stallings William, "Data and Computer Communication", 5th Edition, Prentice Hall of India, 1999

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BCA-205E	OBJECT ORIENTED PROGRAMMING USING JAVA	L-T-P	Cr
		3-0-0	3

OBJECTIVES

- Define the key principles and concepts of object-oriented Programming.
- Manipulate strings using string operations and methods.
- Utilize the collection framework and generics to work with data collections.
- Design user interfaces using Java's AWT and Swing components.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Develop the ability to write control statements for selection and iteration using if, switch, while, do-while, and for loops.

CO2: Demonstrate proficiency in declaring and assigning object reference variables.

CO3: Identify Java's built-in exceptions and handle exceptions appropriately.

CO4: Describe the Java thread model and the concept of main thread.

CO5: Show the ability to access and query databases using JDBC API.

UNIT I

INTRODUCTION:

History and Overview of Java, Object Oriented Programming, Control statements- if and for loop. Using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words, Data types - Integers, Floating point, characters, Boolean, A closer look at Literals, Variables, Type conversion and casting. Automatic type promotion in Expressions Arrays. Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. Control Statements – Selection Statements - if, Switch, Iteration Statemeds - While, Do-while, for Nested loops, Jump statements.

UNIT II

CLASSES:

Class Fundamentals, Declaring objects, Assigning object reference variables. Methods - constructors, “this” keyword, finalize() method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects. Recursion, Access control, Introducing final, understanding static. Introducing Nested and Inner classes. Using command line arguments. Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

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UNIT III

PACKAGES:

Definition. Access protection importing packages. Interfaces: Definition and implementation. Exception Handling – Fundamentals, types, Using try and catch and Multiple catch clauses, Nested try Statements, throw, throws, finally. Java's built-in exception, using Exceptions.

UNIT IV

MULTITHREADED PROGRAMMING:

Java thread model – main thread, creating single and multiple thread. Is alive() and join(). Thread – Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi-threading. I / O basics – Reading control input, writing control output, Reading and Writing files. Applet Fundamentals – AWT package, AWT Event handling concepts, the transient and volatile modifiers. Using instance of using assert.

UNIT V

JAVA DATABASE CONNECTIVITY (JDBC):

Database connectivity – JDBC architecture and Drivers. JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements, handling SQL exceptions. Accessing result sets: types and methods. An example - JDBC application to query a database.

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TEXT BOOKS

1. "Java: The Complete Reference" by Herbert Schildt, McGraw-Hill Education, December 18, 2020.
2. "Effective Java" by Joshua Bloch,Addison-Wesley Professional,December 27, 2017.

REFERENCE BOOKS

1. "Java How to Programs" by Paul Deitel and Harvey Deitel,Pearson,April 16, 2021.

BCA-DS-203E	DATA WRANGLING & PREPROCESSING	L-T-P	Cr
		3-0-0	3

PREREQUISITES

Knowledge of Python Programming

COURSE OUTCOMES

After completing this course, the students will be able:

CO1: To know the basics of data and how the data is read

CO2: To work with different data and file formats

CO3: To clean the data and convert it in consistent form

CO4: To analyse the data with different techniques

CO5: To know about web scraping

UNIT I

INTRODUCTION TO DATA WRANGLING:

What Is Data Wrangling?- Importance of Data Wrangling -How is Data Wrangling performed?- Tasks of Data Wrangling-Data Wrangling Tools-Introduction to Python-Python Basics-Data Meant to Be Read by Machines-CSV Data-JSON Data-XML Data.

UNIT II

DATA PREPROCESSING & CONCEPT LEARNING

Introduction to Data Preprocessing – Reading, Selecting, Filtering Data – Filtering Missing Values – Manipulating, Sorting, Grouping, Rearranging, Ranking Data Formulation of Hypothesis – Probabilistic Approximately Correct Learning - VC Dimension – Hypothesis elimination – Candidate Elimination Algorithm Unit:3 ES

UNIT III

WORKING WITH EXCEL FILES AND PDFS:

Installing Python Packages-Parsing Excel Files-Parsing Excel Files -Getting Started with Parsing-PDFs and Problem Solving in Python-Programmatic Approaches to PDF Parsing-Converting PDF to Text-Parsing PDFs Using pdf miner-Acquiring and Storing Data-Databases: A Brief Introduction-Relational Databases: MySQL and PostgreSQL-Non-Relational Databases: NoSQL-When to Use a Simple File-Alternative Data Storage.

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UNIT IV

DATA CLEANUP:

Why Clean Data?- Data Cleanup Basics-Identifying Values for Data Cleanup-

Formatting Data-Finding Outliers and Bad Data-Finding Duplicates-Fuzzy Matching-RegEx Matching-Normalizing and Standardizing the Data-Saving the Data-Determining suitable Data Cleanup-Scripting the CleanupTesting with New Data

UNIT V

DATA EXPLORATION AND ANALYSIS: Exploring Data-Importing Data-Exploring Table Functions-Joining Numerous Datasets-Identifying Correlations-Identifying Outliers-Creating Groupings-Analyzing Data-Separating and Focusing the Data Presenting Data-Visualizing the Data-Charts-Time-Related Data-Maps- Interactives -Words-Images, Video, and Illustrations-Presentation Tools-Publishing the Data-Open Source Platforms.

TEXT BOOK

Principles of Data Wrangling: Practical Techniques for Data Preparation

REFERENCE BOOKS

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython

2. Data Wrangling with Python: Creating actionable data from raw sources

3. Data Wrangling with Python: Tips and Tools to Make Your Life Easier

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BCA-DS-201E	DATA MINING & WAREHOUSING	L T P	Cr
		3-0-0	3

OBJECTIVES

At the end of the course student will be able to

CO1: Interpret the problem in real time applications, and apply the appropriate data mining technique for effective results.

CO2: Apply different conceptions of data mining and compute OLAP operations.

CO3: List associations and correlations in the given Information domain.

CO4: Apply basic techniques of classification for various applications like banks, health organizations etc.

CO5: Analyze the real time data using various clustering techniques.

UNIT-I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining.

UNIT-II

Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discrimination and Concept Hierarchy Generation, Online Data Storage. Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems.

UNIT-III

Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

UNIT-IV

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Classification and Prediction- Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation.

UNIT- V

Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods: K-Means Clustering Algorithm, Hierarchical Methods: BIRCH Multiphase Hierarchical Clustering using Clustering Features Trees, Density-Based Methods: DBSCAN Density-Based clustering based on connected Regions with High Density, Grid-Based Methods: STING- Statistical information Grid, Introduction to Outlier Analysis- What are Outliers?, Types of Outliers and Challenges.

TEXT BOOKS:

1. Jiawei Han & Micheline Kamber, "Data Mining – Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2008.

2. Margaret H Dunham, "Data Mining Introductory and advanced topics", 6th Edition, Pearson Education, 2009.

REFERENCES:

1. Arun K Pujari, "Data Mining Techniques",1st Edition, University Press, 2005.

2. Pang- Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 1st Edition, Pearson Education,2012.

3. Sam Aanhory& Dennis Murray, "Data Warehousing in the Real World", 1st Edition, Pearson Edition, Asia,2008.

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BCA-211E	DESIGN ANALYSIS & ALGORITHM	L-T-P	Cr
		3-0-0	3

OBJECTIVES

- Gain a comprehensive understanding of algorithms, their role in computing, and their importance as a problem-solving tool in various applications.
- Develop proficiency in analyzing algorithm efficiency using asymptotic notation and basic efficiency classes, enabling the selection and implementation of appropriate algorithms.
- Explore different algorithm design techniques such as brute force, divide and conquer, dynamic programming, and greedy algorithms, to efficiently solve complex computational problems.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Explain algorithms and their significance in computing to solve a wide range of computational problems.

CO2: Compare algorithm efficiency using asymptotic notation based on their time and space complexities.

CO3: Demonstrate various algorithm design techniques, such as brute force, divide and conquer, dynamic programming, and greedy algorithms, empowering the development of efficient and optimized solutions for complex problems.

CO4: Identify algorithm analysis techniques, including sorting, sets and selection, randomized algorithms, and approximation algorithms, to improve algorithm performance and solve optimization problems.

CO5: Describe NP-hard and NP-complete problems, graph algorithms, and their applications, providing the knowledge and skills to tackle complex computational challenges and comprehend concepts related to computational complexity theory.

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UNIT I

ALGORITHM INTRODUCTION

Role of Algorithms in Computing: Introduction: What is an Algorithm? Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Role of algorithms in computing, Algorithms as a technology. Fundamentals of the Analysis of Algorithm Efficiency, Asymptotic notation and Basic Efficiency Classes, Algorithm design,Brute Force approach- Linear Search, Bubble sort, Divide and Conquer algorithms- Quick Sort and Merge sort.

UNIT II

GREEDY ALGORITHMS

The greedy strategy, Greedy methods & optimization, Topological sort, Bipartite cover, Minimum cost spanning trees, Huffman codes, Single source shortest paths-Dijkstra's algorithm

UNIT III

DYNAMIC PROGRAMMING

The method, Computing of Binomial Coefficient and Fibonacci Series, All pairs shortest path-Floyd's algorithm, Assembly line scheduling.The method, Exhaustive search – Traveling salesman problem, Assignment problem.

UNIT IV

SORTING, SETS AND SELECTION

Merge sort, The Set Abstract Data Type, Quick sort, Bucket sort, Radix sort, Selection Sort and Bubble Sort, Sequential Search,Binary Search Comparison of sorting algorithms, Subset problems. Randomized algorithms: This involves the design and analysis of algorithms that make use of randomization to improve performance. Approximation algorithms: This involves the development of algorithms that provide approximate solutions to optimization problems.

UNIT V

NP HARD AND NP COMPLETE PROBLEMS

Polynomial Time, The Classes Of P and NP ,NP-Hard Graph Problems NP- Completeness of the Satisfiability Problem and Polynomial- Space-Bounded Problem.

Graphs: Graph abstract data type, Data structures for graphs, Graph traversals-BFS, DFS, Directed graphs, weighted graphs.

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TEXT BOOKS:

1. "Introduction to the Design and Analysis of Algorithms" by Anany Levitin is 2018**.**
2. "The Art of Computer Programming, Volume 1: Fundamental Algorithms" by Donald E. Knuth (Publication Date: 2018, Publisher: Addison-Wesley Professional).
3. "Algorithm Design: Parallel and Sequential" by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser (Publication Date: 2014, Publisher: Wiley).
4. "Data Structures, Algorithms, and Applications in C" by Sartaj Sahni is the 2nd edition, which was published in 2016.

REFERENCE BOOKS:

1. "Data Structures, Algorithms, and Applications in C" by Sartaj Sahni 2nd edition, published in 2016.
2. Problem Solving in Data Structures & Algorithms Using C by Hemant Jain in 2017

BCA-DS-251E	DATA MINING & WAREHOUSING LAB	L T P	Cr
		0 0 2	1

COURSE OBJECTIVE: The main objective of this course is to enabling the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans.

COURSE OUTCOMES

CO1: Ability to understand the various kinds of tools.

CO2. Demonstrate the classification, clustering and etc. in large data sets.

CO3. Ability to add mining algorithms as a component to the exiting tools.

CO4. Ability to apply mining techniques for realistic data.

LIST OF EXPERIMENTS

1. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
2. Demonstrate performing classification on data sets
3. Demonstrate performing clustering on data sets
4. Demonstrate performing Regression on data set
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. Web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for star schema.

TEXT BOOKS:

1. Jiawei Han & Micheline Kamber, "Data Mining – Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2008.

2. Margaret H Dunham, "Data Mining Introductory and advanced topics", 6th Edition, Pearson Education, 2009.

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REFERENCES:

1. Arun K Pujari, “Data Mining Techniques”,1st Edition, University Press, 2005.

2. Pang- Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, 1st Edition, Pearson Education,2012.

3. Sam Aanhory& Dennis Murray, “Data Warehousing in the Real World”, 1st Edition, Pearson Edition, Asia,2008.

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BCA-255E	OBJECT ORIENTED PROGRAMMING USING JAVA LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVES

- Define the key principles and concepts of object-oriented Programming.
- Manipulate strings using string operations and methods.
- Utilize the collection framework and generics to work with data collections.
- Design user interfaces using Java's AWT and Swing components.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Develop the ability to write control statements for selection and iteration using if, switch, while, do-while, and for loops.

CO2: Demonstrate proficiency in declaring and assigning object reference variables.

CO3: Identify Java's built-in exceptions and handle exceptions appropriately.

CO4: Describe the Java thread model and the concept of main thread.

CO5: Show the ability to access and query databases using JDBC API.

LIST OF EXPERIMENTS:

Part A

1. Write a Programs to check whether two strings are equal or not.
2. Write a Programs to display reverse string.
3. Write a Programs to find the sum of digits of a given number.
4. Write a Programs to display a multiplication table.
5. Write a Programs to display all prime numbers between 1 to 1t000.
6. Write a Programs to insert element in existing array.
7. Write a Programs to sort existing array.
8. Write a Programs to create object for Tree Set and Stack and use all methods.
9. Write a Programs to check all math class functions.
10. Write a Programs to execute any Windows 95 application (Like notepad, calculator etc)
11. Write a Programs to find out total memory, free memory and free memory after executing garbage Collector (gc).

Part B

1. Write a Programs to copy a file to another file using Java to package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.
2. Write a Programs to get file name at runtime and display number f lines and words in that file.
3. Write a Programs to list files in the current working directory depending upon a given pattern.
4. Create a text field that allows only numeric value and in specified length.

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5. Create a Frame with 2 labels, at runtime display x and y command-ordinate of mouse pointer in the labels.

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BCA-291E	CODING AND COMPUTATIONAL THINKING – II LAB	L-T-P	Cr
		0-0-4	2

OBJECTIVES

- Discuss the applicability of mathematical concepts of sets, relations to database management systems.
- Use SQL commands to query databases for relevant results
- Apply normalization techniques to create standardized relations
- Demonstrate SQL and relational databases skills to develop database management systems.

COURSE OUTCOMES:

After completing the course, the students will be able to

CO1: Understand the applicability of mathematical concepts of sets, relations to database management systems.

CO2: Write SQL commands to query databases for relevant results

CO3: Analyses normalization techniques to create standardized relations

CO4: Compare SQL and relational databases skills to develop database management systems.

COURSE CONTENT:

Students understanding of the subject Database management systems can be supported by practicing and taking challenges for both on the Hackerrank platform. Following is a list of suggestive exercises that can be completed on the platform.

Sl. No.	Concept	Challenge	Difficulty levels
1	Basics of Sets and relations	Challenges 1,2,3 and 4	Easy
2	Relational Algebra	Challenges 3 and 4	Medium
3	Database Query Languages and procedural Languages	MCQ's	Easy
4	Normalization	Challenges for 1/2/3NF	Hard

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5	Databases	Keys	Medium
6	SQL	Select All	Easy
7	SQL – DDL, DML	Weather observation station 5	Easy
8	SQL	New Companies	Medium
9	SQL	Top Competitors	Medium
10	SQL	Contest LeaderBoard	Medium

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BCA-202E	SOFTWARE ENGINEERING & TESTING	L T P	Cr
		3-1-0	4

OBJECTIVE

To provide basic knowledge of properties of software and its development processes, software quality, CASE tools, etc.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic concepts of software engineering

CO2: To know about the requirements and process to engineer the software

CO3: To learn how to design a software & what are its strategies

CO4: To aware about the coding, testing & maintenance of software

CO5: To know about different metrics used for software evaluation

UNIT I

INTRODUCTION: Introduction to Software Engineering, Definition of Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Applications, Software Myths. Software Development Life Cycle Model: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

SOFTWARE REQUIREMENT SPECIFICATIONS: Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Control Flow Model, SRS Document, IEEE Standards for SRS, Data Dictionary.

UNIT III

SOFTWARE DESIGN: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Top-Down and Bottom-Up Design.

UNIT IV

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CODING & SOFTWARE TESTING & MAINTENANCE: Top-Down and Bottom –Up programming, structured programming, Code Inspection, Compliance with Design and Coding Standards. Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Alpha and Beta Testing of Products. Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.

UNIT V

SOFTWARE MEASUREMENT & MATRICES: Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. , Quality Assurance, Quality Control, Software Quality Attributes, Software Quality Assurance (SQA): Verification and Validation

TEXT BOOK:

Pressman Roger S., "Software Engineering – A Practitioner's Approach", 6th Edition, McGraw Hill, 2004.

REFERENCE BOOKS

1. Aggarwal KK, Singh, Yogesh, "Software Engineering", New Age International, 2000.
2. Jalote Pankaj,"An Integrated Approach to Software Engineering", 3rd edition, Narosa, 2005.
3. Sommerville Ian, Pearson Education, "Software Engineering", 5th edition, Addison Wesley, 1999.

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BCA-206E	ARTIFICIAL INTELLIGENCE	L T P	Cr
		3-0-0	3

OBJECTIVES

To introduce about artificial intelligence approaches to problem solving, various issues involvedand application areas

PRE-REQUISITES: Knowledge of neural networks, data structures

COURSE OUTCOMES

CO1: Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. Solve basic AI based problem

CO2: Define the concept of Artificial Intelligence and Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Apply AI techniques to real-world problems to develop intelligent systems.

CO4: Select appropriately from a range of techniques when implementing intelligent systems.

CO5: Discuss the basics of ANN and different optimizations techniques

UNIT I

INTRODUCTION TO AI AND SEARCH TECHNIQUES: Foundation and history of AI; data, information and knowledge; AI problems and techniques – AI programming languages, problem space representation with examples; blind search strategies, breadth first search, depth first search, heuristic search techniques: hill climbing: best first search, A * algorithm AO* algorithm, Minimax search procedure for Game Playing.

UNIT II

KNOWLEDGE REPRESENTATION ISSUES AND TECHNIQUES: Predicate logic;

representing knowledge using rules. Semantic nets, partitioned nets, parallel implementation of semantic nets; frames, forward and backward chaining; frame based systems.

UNIT III

REASONING UNDER UNCERTAINITY: Reasoning under uncertainty, non monotonic reasoning; Review of probability; Baye's probabilistic interferences and Dumpster Shafer theory; statistical reasoning, fuzzy reasoning.

UNIT IV

PLANNING & LEARNING: Goal stack planning; non linear planning, hierarchical planning representation for planning; partial order planning algorithm. Basic concepts of Learning ; rote learning, learning by taking advices, learning by problem solving, learning from examples, discovery as learning, learning by analogy; explanation based learning; neural nets; genetic algorithm

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UNIT V

EXPERT SYSTEM AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE: Expert systems: rule based systems architecture: Principles of natural language processing: knowledge acquisition concepts; AI application to robotics, and current trends in intelligent systems; parallel and distributed AI.

TEXT BOOK

Rich Elaine and Knight Kevin, ―Artificial Intelligence 3rd Edition, Tata McGraw Hill, 1991

REFERENCE BOOK

1.Nilson Nils J., ―Artificial Intelligence‖, McGraw-Hill, New York 1971

2.Russell Stuart and Norvig Peter, ―Artificial Intelligence: A Modern Approach‖, Prentic Hall of India, 1998

3.Negnevitsky, ―Artificial Intelligence: A Guide to Intelligent System ‖, Pearson Education,2004.

4.Patterson O. W., ―Introduction to Artificial Intelligence & Expert Systems‖, PrenticeHall of India, 1996.

5.Winston Patrick Henry, ―Artificial Intelligence, 3rd Edition, Addition Wesley, 1992

6.Clockson & Mellish, ―Programming PROLOG‖, 3rd Edition, Narosa Publications, 2002.

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BCA-DS-202E	R PROGRAMMING for DATA SCIENCE	L T P	Cr
		3 0 0	3

OBJECTIVE

In this course students will learn R. Programming language, data analytics, data visualisation and statistical model for data analytics. By completion of this course, students will be able to become data analyst.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: An introduction to resources for continuing to develop their R skill set.

CO2.The ability to perform basic data transformation, analysis and visualisation with R.

CO3.A framework for applying R to their own domain-specific problems Familiarize participants with R syntax

CO4. Understand the concepts of objects and assignment

UNIT I

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.

UNIT II

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.

UNIT III

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.

UNIT IV

Random Forest, Decision Tree, Normal and Binomial distributions,Time Series Analysis,Linear and Multiple Regression, Logistic Regression, Survival Analysis

UNIT V

Prescriptive Analytics Creating data for analytics through designed experiments,Creating data for analytics through active learning, Creating data for analytics through reinforcement learning

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TEXT BOOKS

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). URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf

REFERENCE BOOKS

1.Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013

2. Dunlop, Dorothy D., and Ajit C. Tamhane. Statistics and data analysis: from elementary to intermediate. Prentice Hall, 2000.

3. G Casella and R.L. Berger, Statistical Inference, Thomson Learning 2002.

4. P. Dalgaard. Introductory Statistics with R, 2nd Edition. (Springer 2008)

5. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer

6. Hastie, Trevor, et al.The elements of statistical learning.Vol. 2. No. 1. New York: springer, 2009.

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BCA-256E	ARTIFICIAL INTELLIGENCE LAB	L T P	Cr
		0-0-2	1

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of prolog programming language

CO2: To learn the different iterative structures using prolog

CO3: To learn about different problems and solution by prolog

CO4: To know about different searching methods

CO5: To aware about the natural language processing

LIST OF EXPERIMENTS

1. Study of Prolog programming language
2. Write programs to use iterative structures using Prolog (at least 3 programs)
3. Write programs to demonstrate inferencing/ deductive logic using Prolog (at least 3 programs)
4. Write a program to solve 8 queens problem using Prolog.
5. Solve any problem using depth first search using Prolog.
6. Solve any problem using best first search using Prolog.
7. Solve 8-puzzle problem using best first search using Prolog
8. Solve Robot (traversal) problem using means End Analysis using Prolog.
9. Solve traveling salesman problem using Prolog.
10. Write program to exhibit the ability of building an Expert System using Prolog
11. Study the properties and issues of Natural Language Processing

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12. Study the grammar mapping issues in language translation from English to Hindi and vice versa

REFERENCE BOOKS

1. Clockson & Mellish, “Programming PROLOG”, Narosa Publications, 3rd Edition, 2002.
2. Winston Patrick Henry, “Artificial Intelligence”, 3rd Edition, Addition Wesley, 1992

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BCA-DS-252E	R PROGRAMMING for DATA SCIENCE LAB	L T P	Cr
		0-0-2	1

OBJECTIVE

In this course students will learn R. Programming language, data analytics, data visualisation and statistical model for data analytics. By completion of this course, students will be able to become data analyst.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: An introduction to resources for continuing to develop their R skill set.
CO2.The ability to perform basic data transformation, analysis and visualisation with R.
CO3.A framework for applying R to their own domain-specific problems Familiarize participants with R syntax
CO4. Understand the concepts of objects and assignment

LIST OF EXPERIMENTS

1. Programs related to the basics:
Write a program in R to take input from the user (name and age) and display the values. Also print the version of R installation.
Write a program in R to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
Write an R program to create a vector which contains 10 random integer values between -50 and +50. Write a program in R to find the factors of a given number.
Write a program in R to find the maximum and the minimum value of a given vector.

2.Programs related to the array:
Write a program in R to convert a given matrix to a 1 dimensional array.
Write a program in R to create an array of two 3x3 matrices each with 3 rows and 3 columns from two given two vectors.
Write a program in R to create an 3 dimensional array of 24 elements using the dim() functio n.

3.Programs related to the Data Frame:
Write a program in R to create an empty data frame.
Write a program in R to create a data frame from four given vectors.
Write a program in R to get the structure of a given data frame.
Write a program in R to get the statistical summary and nature of the data of a given data frame.
Write a program in R to extract first two rows from a given data frame.
Write a program in R to add new row(s) and column(s) to an existing data frame.

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TEXT BOOKS

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 BOOKS

1.Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013

2. Dunlop, Dorothy D., and Ajit C. Tamhane. Statistics and data analysis: from elementary to intermediate. Prentice Hall, 2000.

3. G Casella and R.L. Berger, Statistical Inference, Thomson Learning 2002.

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BCA-260E	MONGO DB	L T P	Cr
		0-0-2	1

Course Objectives:

The goal of this course is to provide students with a thorough understanding of NoSQL databases, with a focus on MongoDB. Students will learn about the different types of databases and their uses, delve into MongoDB's architecture and functionalities, and develop skills in managing data through CRUD operations and aggregation. The course also covers advanced topics such as indexing, database operations, and replication to prepare students for real-world database management and optimization.

Course Outcomes:

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

1. Understand the need for and differentiate between various types of databases, including relational and non-relational (NoSQL) databases.
2. Navigate MongoDB's architecture, components, and configuration settings effectively.
3. Manage data using documents and collections in MongoDB, including insertion, updating, and deletion of documents.
4. Implement CRUD operations and indexing strategies to optimize database performance.
5. Utilize MongoDB's aggregation framework and understand database operations such as backup, restore, and replication for reliable data management.

LIST OF EXPERIMENTS

1. Download and install MongoDB, and set the path in the environment variable.
2. Identify the MongoDB environment, use Mongo Shell, and configure the MongoDB configuration file.
3. Create a MongoDB database named employee, then create collections emp_personal_details (with fields: emp_id, emp_name, emp_address, emp_DOB, emp_age, emp_mobilenumber) and emp_professional_details (with fields: emp_id, emp_name, designation, salary, incentive, working hours).
4. Insert 10 records into both emp_personal_details and emp_professional_details collections, then query to show employees with the designation "manager" and those with a salary of 6000.
5. Update the emp_personal_details collection to add a field status set to "retired" where age is greater than 60, update the emp_professional_details collection to give an incentive of 5000 to employees with working hours greater than 45 per week, and add 1000 to the salary of employees whose designation is "accountant".

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6. Create indexes on the emp_id field in emp_professional_details, then create a compound index on emp_id and emp_name.
7. Find the sum of salaries for employees with the designation "clerk", and filter employees with the designation "software engineer" to find the minimum salary.
8. Use the $unwind command to display employees whose mobile number is stored in an array, the $skip command to skip the first 3 records and display the rest, and the $limit command to show only the first four records from the collection.
9. Create a backup of the emp_personal_details and emp_professional_details collections, delete some records, restore them from the backup, export the collection in CSV and JSON formats, then delete records and import the collections back.
10. Create a replica set for the employee database, insert records into the primary node, and verify that the same records are displayed in secondary nodes.

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PROJ-292E	MINOR PROJECT	L T P	Cr
		0-0-4	2

OBJECTIVE

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

The projects should be socially relevant and research oriented ones. Student is expected to do an individual project or in group of 3 members. The project work is carried out in two phases – Minor Project in V semester and Major Project in VI semester. Major project of the project work shall be in continuation of Minor Project only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

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Syllabus

of

BCA(DS)

5th Semester

&

6th Semester

JAIN (Deemed-to-be University)
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School : School of Computer Applications	Batch : 2024– 27
Course : BCA(DATA SCIENCE)	Year : 3rd
	Semester : V

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	BCA-301E	Software Project Management	3	0	0	3	15	25	60	-	-	100
2	PCC	BCA-303E	Computer Graphics & Multimedia	3	0	0	3	15	25	60	-	-	100
3	PEC	BCA-DS-301E	Business Data Analytics	3	0	0	3	15	25	60	-	-	100
4	PEC	ABMA-CS	Academic Basket (Preference-I)	4	0	0	4	15	25	60	-	-	100
5	PEC	ABMI-CS	Academic Basket (Preference-II)	2	0	0	2	15	25	60	-	-	100
6	PCC	BCA-307E	Data Visualization (Power BI)	3	0	0	3	15	25	60	-	-	100
7	PEC		Elective-II	3	0	0	3	15	25	60	-	-	100
8	PCC	BCA-DS-357E	Data Visualization (Power BI) Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	BCA-353E	Computer Graphics & Multimedia Lab	0	0	2	1	-	-	-	60	40	100
10	PROJ	PROJ-391E	Major Project	0	0	8	4	-	-	-	60	40	100
11	PEC	PEC-CS-301E	MOOC Course-II (NPTEL)	2	0	0	2	-	-	-	-	-	100
			Total	23	0	12	29						

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LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES
SESSION: 2026-27

School : School of Computer Applications	**Batch : 2024 – 27**
Course : BCA(DATA SCIENCE)	**Year : 3rd**
	Semester : VI

SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PROJ	PROJ-392E	Internship/ Major Project	0	0	40	20	-	-	-	60	40	100
2	PEC	PEC(CS)-302E	MOOC Course-III(NPTEL)	3	0	0	3	-	-	-	-	-	100
			Total	3	0	40	23						

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BCA-301E	SOFTWARE PROJECT MANAGEMENT	L T P	Cr
		3 0 0	3

OBJECTIVE

To provide the foundation required for becoming a good software project manager by means of planning, evaluation and estimation, risk management, allocation and monitoring of resources, controlling software quality PRE-REQUISITES Knowledge of software engineering and the basic principles of management

COURSE OUTCOMES

The students after undergoing this course will be able to:

CO1: Identify the different project contexts and suggest an appropriate management strategy.

CO2: Practice the role of professional ethics in successful software development.

CO3: Identify and describe the key phases of project management.

CO4: Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

CO5: Methods to Maintain the Software Quality Assurance

UNIT I

INTRODUCTION: Definition of a Software Project (SP), SP vs. other types of projects activities covered by SPM; categorizing SPs; project as a system; management control, requirement specification; information and control in organization

STEPWISE PROJECT PLANNING: Introduction, selecting a project; identifying project scope and objectives; identifying project infrastructure, analyzing project characteristics; identifying project products and activities; estimate efforts each activity; identifying activity risk; allocate resources; review/ publicize plan

UNIT II

PROJECT EVALUATION AND ESTIMATION: Cost benefit analysis; cash flow forecasting; cost benefit evaluation techniques; risk evaluation; Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods: rapid application development, water fall, V-process-, spiral- models; Prototyping.

ACTIVITY PLANNING : Objectives of activity planning; project schedule; projects and activities; sequencing and scheduling activities, network planning model; representation of lagged activities; adding the time dimension, backward and forward pass; identifying critical path; activity throat, shortening project; precedence networks.

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UNIT III

RESOURCE ALLOCATION AND MONITORING THE CONTROL: Introduction, the nature of resources, identifying resource requirements; scheduling resources creating critical paths; counting the cost; being specific; publishing the resource schedule; cost schedules, the scheduling sequence; Monitoring the control: Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

UNIT IV

MANAGING CONTRACTS AND PEOPLE:, Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises

UNIT V

SOFTWARE QUALITY: Introduction; the place of software quality in project planning; the importance of software quality; defining software quality, ISO 9126; Practical software quality measures; product versus process quality management; 46 external standards; techniques to help enhance software quality; Study of any software project management software: viz Project 2005 or equivalent.

TEXT BOOKS

Bob Hughes and Mike Cotterell, ―Software Project Manag em ent‖, 2nd Edition, Tata McGraw Hill, 1999

REFERENCE BOOKS

1. Futrell, ―Software Quality & Project Manag em ent‖, Pearson Education, 2002.
2. Jalote Pankaj, Software Project Management, Pearson Education, 2002.
3. Gopalaswam y Ramesh, ―Managing Global Software Projects‖, Tata McGraw Hill, 2001
4. Pressman Roger S., ―Software Engineering – A Practitioner‘s Approach‖, 5th Edition, McGraw Hill, 2001
5. Walker Royce, ―Software Project Manag em ent‖, Addison Wesley, 1998
6. Maylor, ―Project Manag em ent‖, Third Edition, 2003.
7. Demarco Tom, ―Controlling Software Project Management and Measurem ent‖, Prentice Hall, 1982 8. Glib Tom and Susannah Finzi, ―Principles of Software Engineering Management‖, Addison Wesley, 1998.

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BCA-303E	COMPUTER GRAPHICS & MULTIMEDIA	L T P	Cr
		3 0 0	3

OBJECTIVES

- Write programs Using C/C++/ OpenGL graphics environment.
- Use polygonal and other modelling methods to describe scenes.
- Understand and be able to apply geometric transformations.
- Create basic animations.

COURSE OUTCOMES

Students after undergoing this course will be able to:

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

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

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

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

CO5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

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UNIT I

INTRODUCTION: What is computer graphics, computer graphics applications, computer graphics hardware and software, basic graphics system and standards; Raster Scan and Random Scan graphics; Raster-Scan Display System, Video Controller, Random-Scan Display processor, frame buffer.

UNIT II

ALGORITHMS: Two dimensional graphics primitives: points and lines, line drawing algorithms: DDA, Bresenham's; circle drawing algorithms: using polar coordinates, Bresenham's circle drawing, midpoint circle drawing algorithm.

UNIT III

TWO AND THREE DIMENSIONAL TRANSFORMATION: Two dimensional transformations: translation, scaling, rotation, reflection, shearing, transformation, Homogeneous coordinates system, 2D composite transformation: matrix Representation of 3-D transformations, composition of 3-D transformation;

UNIT IV

TWO DIMENSIONAL VIEWING AND CLIPPING: The 2-D viewing pipeline, windows, viewports, window to View port mapping; clipping: point, clipping line (algorithms): 4 bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Sutherland-Hodgeman polygon clipping algorithm

UNIT V

THREE DIMENSION VIEWING AND HIDDEN SURFACE REMOVAL: viewing in 3D: projections, types of projections; the mathematics of planner geometric projections; coordinate systems: Introduction to hidden surface removal; the Z- buffer algorithm, scan-line algorithm, area sub-division algorithm.

TEXT BOOK

Donald Hearn & M. Pauline Baker," Computer Graphics", Prentice Hall of India

REFERENCE BOOK

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Asthana, Sinha, "Computer Graphics", Addison Wesley Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
3. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
4. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

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BCA-DS-301E	BUSINESS DATA ANALYTICS	L-T-P	Cr
		3-0-0	3

OBJECTIVES

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Understand and exercise basic coding sequential, conditional, and looping structure for business decision making.

CO2: Application of advanced data management tasks using Python for reading, writing, cleaning of data and reshaping datasets.

CO3: Perform exploratory and statistical analysis with Python for various business functions.

CO4: Design and develop analytical skills for creating datastructures and applications in business data management.

UNIT I

INTRODUCTION TO BUSINESS DATA ANALYSIS,

- KNOWLEDGE DOMAINS OF DATA ANALYST
- UNDERSTANDING THE NATURE OF DATA
- DATA ANALYSIS PROCESS
- QUANTITATIVE AND QUALITATIVE DATA
- ANALYSIS CASE STUDY 1

UNIT II

- NUMPY-TYPES OF DATA
- ARITHMETIC OPERATIONS
- UNIVERSAL FUNCTIONS MATRIX
- INDEXING ARRAYS, LOADING FILES
- READING FILES WITH TABULAR DATA; INTRODUCTION TO SCIPY
- CASE STUDY 2

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UNIT III

- PANDAS FUNCTION BY ELEMENT; FUNCTION BY ROW/COLUMN
- CSV AND TEXT FILES
- MERGING, CONCATENATING; DATA TRANSFORMATION
- DATA AGGREGATION

UNIT IV

- MATPLOTLIB, PLOTTING WINDOWS
- PLOTTING CHARTS; ADDING TEXT, BAR CHART, HISTOGRAM, PI CHARTS, LINE CHARTS
- WRITING MATHEMATICAL EXPRESSIONS
-

UNIT V

- PEN DATA SOURCES ANALYSIS: POLITICAL AND GOVERNMENT
- DATA SOURCES ANALYSIS: CLIMATE AND HEALTH DATA
- REPORTS GENERATION
- INFERENCES FROM SECONDARY OPEN SOURCE

TEXT BOOKSS:

1.W. McKinney, 2017, Python for Data Science, OReilly Media Inc.

2. F. Nelli, 2015, Python Data Analytics, Apress

REFERENCE BOOKS:

1. J. Rogel, 2018, Salazar, Chapman and Hall, Data Science and Analytics with Python, CRC Press
2. A. B. Downey, 2014, ThinkStats2, OReilly Media Inc..

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BCA-307E	DATA VISUALIZATION(POWER BI)	L-T-P	Cr
		3-0-0	3

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: Design effective data visualizations in order to provide new insights

CO2: Find and select appropriate data that can be used in order to create visualization

CO3: Find and save data to IU-supported research storage for both short- and long-term preservation in order to comply with data management mandates

CO4: Handle data and data visualizations in a manner that demonstrates an understanding of ethical considerations surrounding data

CO5: Properly document and organize data and visualizations in order to prepare them for reuse.

UNIT I

INTRODUCTION TO VISUALIZATION:

Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color as a Tool to Distinguish, Color to Represent Data Values ,Color as a Tool to Highlight, Directory of Visualizations-Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

UNIT II

VISUALIZING DISTRIBUTIONS:

Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile- Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

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UNIT III

VISUALIZING ASSOCIATIONS & TIME SERIES:

Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose–Response Curves, Time Series of Twoor More Response Variables.

UNIT IV

VISUALIZING UNCERTIANITY:

Visualizing Trends Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

UNIT V

PRINCIPLE OF FIGURE DESIGN:

The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding Too Much or Irrelevant Information ,Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency

TEXT BOOKSS:

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Claus Wilke, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, 1st edition, O’Reilly Media Inc, 2019.

REFERENCE BOOKS:

1. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems,Apress, 2018

2. Scott Murray, “Interactive data visualization for the web”, O“Reilly Media, Inc., 2013

choose to know

BCA-DS-357E	DATA VISUALIZATION(POWER BI) LAB	L-T-P	Cr
		0 -0-2	1

COURSE OUTCOMES

Students after undergoing this course will be able to:

CO1: Understand the importance of data visualization for business intelligence and decision making.

CO2: Know approaches to understand visual perception

CO3: Learn about categories of visualization and application areas

CO4: Familiarize with the data visualization tools.

CO5: Gain knowledge of effective data visuals to solve workplace problems.

LIST OF EXPERIMENTS

1. Introduction to various Data Visualization tools
2. Basic Visualization in POWER BI
3. Basic Visualization in R
4. Introduction to Tableau and Installation
5. Connecting to Data and preparing data for visualization in Tableau
6. Data Aggregation and Statistical functions in Tableau
7. Data Visualizations in Tableau
8. Basic Dashboards in Tableau

REFERENCE BOOKS

1. Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019

2. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018

3. Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020

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BCA-353E	COMPUTER GRAPHICS & MULTIMEDIA LAB	L T P	Cr
		0 0 2	1

OBJECTIVES

- Write programs Using C/C++/ OpenGL graphics environment.
- Use polygonal and other modelling methods to describe scenes.
- Understand and be able to apply geometric transformations.
- Create basic animations.

COURSE OUTCOMES

Students after undergoing this course will be able to:

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

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

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

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

CO5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

LIST OF EXPERIMENTS

1. Write a program for 2D line as raster graphics display using Bresenhem line drawing algorithm
2. Write a program for 2D line drawing as raster graphics display using DDA line drawing algorithm
3. Write a program for circle drawing as raster graphics display using mid point circle drawing algorithm
4. Write a program for circle drawing as raster graphics display using Bresenhems circle drawing algorithm
5. Write a program for Transformation operations using
   a) 2D Translation Transformation
   b) 2D Scaling Transformation
   c) 2D Rotation Transformation
6. Write a program for line clipping
7. Write a program for polygon clipping

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8. Write a program for display 3D object as 2D raster graphics display using perspective transformation
9. Write a program for rotation for 3D object about arbitrary axis
10. Write a program to create screen saver using graphics Commands

REFERENCE BOOKS

1. Pradeep Bhatia, "Computer Graphics", 2nd Edition, I K Publishers, 2009.
2. Computer Graphics by Donald Hearn and M. Pauline Baker, 2nd Edition, Prentice Hall of India, 1999
3. Procedural Elements for Computer Graphics, David F. Rogers, Tata McGraw Hill, Second Edition, 2001

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PROJ-391E	MAJOR PROJECT	L-T-P	CR
		0-0-8	4

OBJECTIVES

1. Identify and discuss the role and importance of research in the emerging Technology and Engineering
2. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem
3. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
4. Ability to present the findings of their technical solution in a written report.
5. Presenting the work in International/ National conference or reputed journals

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Develop aptitude for research and independent learning.

CO2: Demonstrate the ability to carry out literature survey and select unresolved problems in the domain of the selected project topic

CO3: Gain the expertise to use new tools and techniques for the design and development.

CO4: Acquire the knowledge and awareness to carry out cost-effective and environment friendly designs.

CO5: Develop the ability to write good technical report, to make oral presentation of the work, and to publish the work in reputed conferences/journals.

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The Major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study.

The Major research Project should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need

- Problems of national importance
- Research and development in various domain
- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation
- Experimental verification / Proof of concept
- Design, fabrication, testing of Communication System.

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PROJ-392E	INTERNSHIP/ MAJOR PROJECT	L-T-P	CR
		0-0-40	20

OBJECTIVES

6. Identify and discuss the role and importance of research in the emerging Technology and Engineering
7. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem
8. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
9. Ability to present the findings of their technical solution in a written report.
10. Presenting the work in International/ National conference or reputed journals

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Develop aptitude for research and independent learning.

CO2: Demonstrate the ability to carry out literature survey and select unresolved problems in the domain of the selected project topic

CO3: Gain the expertise to use new tools and techniques for the design and development.

CO4: Acquire the knowledge and awareness to carry out cost-effective and environment friendly designs.

CO5: Develop the ability to write good technical report, to make oral presentation of the work, and to publish the work in reputed conferences/journals.

The Major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study.

The Major research Project should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain
- Literature survey Problem Definition

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- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation
- Experimental verification / Proof of concept
- Design, fabrication, testing of Communication System.

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SCHEME OF STUDIES
SESSION: 2024-27

	Code	Subjects
Elective-I	BCAE-208E	Introduction to E-Commerce
	BCAE-204E	Mobile Computing
	BCAE-206E	Cryptography & Data Compression
Elective- II	BCAE-301E	Internet of Things(IoT)
	BCAE-303E	Digital Marketing
	BCAE-305E	UI/UX Design

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BCAE-208E	INTRODUCTION TO E-COMMERCE	L T P	Cr
		3-0-0	3

OBJECTIVE

This course emphasizes the major concepts and activities of e-commerce. It presents an e-commerce framework. Various topics are covered including electronic payment systems, order fulfillment, electronic customer relationship management, e-auctions, business to business e-commerce, selling and buying in private e-markets, e-supply chains, collaborative commerce, intrabusiness ecommerce, corporate portals, mobile commerce and pervasive computing.

PRE-REQUISITES

Knowledge of internet and web development, data mining, computer networks, software engineering.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic concepts of e-commerce

CO2: To aware about the infrastructure required in e-commerce

CO3: To know about the payment system operated electronically

CO4: To aware about e- commerce law

CO5: To learn about e-commerce

UNIT I

INTRODUCTION TO E-COMMERCE: Benefits; impact of e-commerce; classification of e-commerce; application of e-commerce technology; business models; framework of e-commerce.; business to business; business to customer; customer to customer; advantages and disadvantages of e-commerce; electronic commerce environment and opportunities: back ground – the electronic commerce environment – electronic market place technologies.

UNIT II

NETWORK INFRASTRUCTURE OF E-COMMERCE: Network infrastructure to e-commerce & internet; LAN; Ethernet (IEEE 802.3); WAN; internet; TCP/IP reference model; domain names; internet industry structure; FTP applications; protocols required for ecommerce;

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HTTP; CGI 3; firewalls; securing web service; secure payment system transaction security (SET); cryptology; digital signatures

UNIT III

ELECTRONIC PAYMENT SYSTEM & EDI: Introduction to electronic cash and electronic payment schemes – internet monitory payment; different models; framework; prepaid and post-paid payment model and security requirements – payment and purchase order process – online electronic cash. Search tools: directories; search engines; Meta search engines. EDI & E-content: Business Trade Cycle; EDI; EDI Fact, Electronic content.

UNIT IV

Legal Issues Related to E-Commerce, Ethical Issues Related to E-Commerce , Cyber Laws 7:laws of the internet & the world wide web,information technology (it) act-2000

UNIT V

M-COMMERCE, ADVERTISING & CRM: Introduction to mobile commerce; framework; applications; design methodology and advantages; future trends in m-commerce. Supply chain management in e-commerce. Internet Advertising; Models of Internet advertising; sponsoring content; Corporate Website; Weaknesses in Internet advertising; web auctions. E-retailing; Role of retailing in E-commerce; E-marketing and advertising. CRM in e-commerce.

CASE STUDY: Discussion on a corporate web site, E-commerce legal issues & cyber laws.

TEXT BOOK

1. Chaffey, Dave, "E-business and E-commerce Management", Pearson Education,
2. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
3. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce–A ManagerialPerspective", Addison-Wesley.

REFERENCE BOOKS

1. Kalakota, Ravi, Whinston Andrew B . , "E-Commerce-A Manager's guide", Addison Wesley.
2. David Whetley; E-commerce concepts.

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BCAE-202E	DATA WAREHOUSING AND MINING	L T P	Cr
		3 0 0	3

OBJECTIVE

This course introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Students will also be exposed to a sample of data mining applications.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand the functionality of the various data mining and data warehousing component

CO2: Appreciate the strengths and limitations of various data mining and data warehousing models

CO3: Explain the analyzing techniques of various data

CO4: Describe different methodologies used in data mining and data ware housing.

CO5: Compare different approaches of data ware housing and data mining with various technologies.

UNIT I

DATA WAREHOUSING: Definition, usage and trends. DBMS vs data warehouse, data marts, metadata, multidimensional data mode, data cubes, schemas for multidimensional database: stars, snowflakes and fact constellations.

UNIT II

DATA WAREHOUSE ARCHITECTUREANDIMPLEMENTATION: OLTP vs. OLAP, ROLAP vs MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager, Computation of data cubes, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse.

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UNIT III

DATA MINING &ITS CURRENT TRENDS: Definition and task, KDD versus data mining, data mining techniques, Spatial databases, multimedia databases, time series and sequence data, mining text databases and mining Word Wide Web tools and applications. Strategy and business model current trends in data mining, open research area should be added in the course.

UNIT IV

DATA MINING QUERY LANGUAGES: Data specification, specifying knowledge, hierarchy specification, pattern presentation and visualization specification, data mining languages and standardization of data mining.

UNIT V

DATA MINING TECHNIQUES: Association rules, clustering techniques and implementation, decision tree knowledge discovery through neural networks and genetic algorithm, rough sets, support vector machines and fuzzy techniques.

TEXT BOOK

Data Mining Techbniques by ArjunPujri,PHI, Publication

REFERENCES:

1. Berson, "Data Warehousing, Data-Mining & OLAP", TMH
2. Mallach, "Decision Support and Data Warehousing System", TMH
3. Bhavani Thura-is-ingham, "Data-Mining Technologies, Techniques Tools & Trends", CRC Press
4. Navathe, "Fundamental of Database System", Pearson Education
5. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics", Pearson Education
6. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education

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BCAE-204E	MOBILE COMPUTING	L-T-P	Cr

OBJECTIVES

It enables the students to describe what IoT is and how it works today, Recognise the factors that contributed to the emergence of IoT and Design and program IoT devices.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To gain the knowledge about various types of Wireless Data Networks and Wireless Voice Networks.

CO2: Understand the architectures, the challenges and the Solutions of Wireless Communication.

CO3: Realize the role of Wireless Protocols in shaping the future Internet.

CO4: Able to develop simple Mobile Applications Using Toll kitTo Use real IoT protocols for communication.

UNIT-I

Mobile Physical Layer: Review of generation of mobile services, overview of wireless telephony, cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Mobile Computing Architecture: Issues in mobile computing, three tier architecture for mobile computing, Mobile file systems, Mobile databases. WAP: Architecture, protocol stack, Data gram protocol, Wireless transport layer security, Wireless transaction protocol, wireless session protocol, application environment, and applications.

UNIT-II

Mobile Data Link Layer: Wireless LAN over view, IEEE 802.11, Motivation for a specialized MAC, Near & far terminals, Multiple access techniques for wireless LANs such as collision avoidance, polling, Inhibit sense, spread spectrum, CDMA , LAN system architecture, protocol architecture.

Blue Tooth: IEEE 802.15 Blue tooth User scenarios, physical, MAC layer and link management. Local Area Wireless systems: WPABX, IrDA, ZigBee, RFID, WiMax

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UNIT-III

MOBILE IP Network Layer: IP and Mobile IP Network Layer- Packet delivery and Handover Management Location Management- Registration- Tunnelling and Encapsulation-Route Optimization- Dynamic Host Configuration Protocol, Ad Hoc networks,, MAC issues, Routing protocols, global state routing.

Mobile Transport Layer: Traditional TCP/IP, Transport Layer Protocols-Indirect, Snooping, Mobile TCP.

UNIT-IV

Support for Mobility: Data bases, data hoarding, Data dissemination, UA Prof and Caching, Service discovery, Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, Mobile devices and File systems, Data Synchronization, Sync ML.

UNIT-V

Introduction to Wireless Devices and Operating systems: Palm OS, Windows CE, Symbion OS, Android, Mobile Agents. Introduction to Mobile application languages and tool kits.

Text Books:

1. J. Schiller, ―Mobile Communications‖, 2nd edition, Pearson, 2011.
2. Raj Kamal ―Mobile Computing‖ Oxford Higher Education, Second Edition, 2012.
3. Dharam prakash Agrawal and Qing-An Zeng, ―Introduction to Wireless and Mobile Systems‖ 3rd edition, Cengage learning 2013.

Reference Books:

1. Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal ―Mobile Computing‖, Tata McGraw Hill Pub ,Aug – 2010
2. Pei Zheng, Larry L. Peterson, Bruce S. Davie, Adrian Farrell ―Wireless Networking Complete‖
3. Morgan Kaufmann Series in Networking , 2009 (introduction, WLAN MAC)
4. Vijay K Garg ―Wireless Communications & Networking‖ Morgan Kaufmann Series, 2010
5. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
6. Charles Perkins, Mobile IP, Addison Wesley.
7. Charles Perkins, Ad hoc Networks, Addison Wesley.
8. Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, ―Principles of Mobile Computing,Springer.

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Language support: XHTML-MP, WML, WML Script.

Mobile application languages- XML, Voice XML, Java, J2ME, Java Card

TooL Kits: WAP Developer tool kit and application environment, Android Mobile Applications Development

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BCAE-206E	CRYPTOGRAPHY AND DATA COMPRESSION	L T P	Cr
		3 0 0	3

OBJECTIVE

The course will provide a down-to-earth overview of cryptographic techniques applicable in an IT environment, and outline the constraints and limitations of realistic secure systems. A running theme is the tradeoff between usability and security of a system. Also covered are a number of compression techniques - data compression and data encryption are, in some respects, closely related. A working knowledge of C is assumed and essential.

COURSE OUTCOMES

CO1: Understand and analyze public-key cryptography, RSA and other public-key cryptosystems

CO2: Analyze and design hash and MAC algorithms, and digital signatures.

CO3: Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.

CO4: Understand key management and distribution schemes and design User Authentication Protocol

CO5: Know about Intruders and Intruder Detection mechanisms, Types of Malicious software, Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations.

UNIT I

COMPRESSION: Packing; Huffman coding; run length encoding; Lempel-Ziv-Welch; Phil Katz's PKZIP; Delta modulation; JPEG.

UNIT II

ERROR DETECTION AND CORRECTION: Parity; 1, 2, n-dimensions, Hamming codes; p-out-of-q codes

UNIT III

CRYPTOGRAPHY: Vocabulary; history, steganography – visual, textual; cipher hiding; false errors; public key cryptography - authentication, signatures, deniability

UNIT IV

MATHEMATICS: Information; confusion; diffusion; modular arithmetic; inverses; Fermat's little theorem, Chinese remainder theorem; factoring; prime numbers; discrete logarithms

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UNIT V

ALGORITHMS: DES; AES (Rijndael); IDEA; one time pad; secret sharing and splitting; RSA; elliptic curves; modes; random numbers

REFERENCE BOOKS

1. IEEE, "Integration of Data Compression and Cryptography: Another Way to Increase the Information Security", IEEE Computer Society
2. Schneier B., "Applied Cryptography: Protocols, Algorithms and Source Code in C", 2nd edition, Wiley, 1996.
3. Desai Suhag, "Security in Computing", Pearson Education
4. Trappe W. and Washington L., "Introduction to Cryptography", 2nd edition, Pearson Education, 2006

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BCAE-301E	INTERNET OF THINGS (IoT)	L-T-P	Cr
		3 0 0	3

OBJECTIVES

It enables the students to describe what IoT is and how it works today, Recognise the factors that contributed to the emergence of IoT and Design and program IoT devices.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To Use real IoT protocols for communication

CO2: To Secure the elements of an IoT device

CO3: To Design an IoT device to work with a Cloud Computing infrastructure

CO4: Transfer IoT data to the cloud and in between cloud providers

CO5: To Define the infrastructure for supporting IoT deployments

UNIT I

IOT: What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues

UNIT II

IOT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III

IOT ARCHITECTURE:

IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

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UNIT IV

WEB OF THINGS:

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

UNIT V

IOT APPLICATIONS:

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc

Textbook:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013 Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

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BCAE-303E	DIGITAL MARKETING	L-T-P	Cr
		3 0 0	3

OBJECTIVES

The objective of a digital marketing subject is to provide students with a comprehensive understanding of how to effectively use digital channels and technologies to promote products, services, and brands.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand different digital marketing types

CO2: Understand the main concepts and key technologies of digital marketing.

CO3: Remember the concept of e-banking, cyber security

CO4: Analyze the evolution of digital marketing from the existing technologies.

CO5: Analyze services using digital marketing.

SYLLABUS

UNIT- I

Introduction: Nature, Scope and Importance of Digital Marketing; Evolution of Digital

Marketing; Core Concepts-Inbound Marketing, Content Marketing, Email Marketing, InfluentialMarketing; Holistic Digital Marketing Concept, 10Ps of digital marketing; Digital Marketing Environment: Macro and Micro Environment.

UNIT II

E-banking: approaches, devices, services, benefits, drawbacks, Electronic payment systemscredit cards, debit cards, smart cards, credit accounts, cyber security, encryption, secret key cryptography, public key cryptography, digital signatures, firewalls.

UNIT III

Digital Marketing: Search Engine Optimization (SEO), Social Media, Content Marketing;

Email Marketing, Mobile Marketing. Challenges for Digital Marketing: Increased Security Risk, Cluttered Market, Less Focus on Keywords, More Ad Blockers, Increased Ad Costs

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UNIT IV

Digital Marketing: Pay per Click-Search Engine Advertising, Advantages, Factors, Conversion Rate Optimization (CRO); Digital Marketing- Web Analytic. Social Media Marketing: Face book, Pinterest, Twitter, LinkedIn, YouTube, Google Adwords, Google Analytics; Issues and Future enhancement of Digital Marketing.

BOOKS:

1. Ian Dodson-The art of Digital Marketing, Wiley
2. Digital Marketing Strategy: An Integrated Approach to Online Marketing, By Simon Kingsnorth.
3. Digital Marketing, By Dave Chaffey & Fiona Ellis-Chadwick.
4. Puneet Singh Bhatia- Fundamentals of Digital Marketing, Pearson Education

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BCAE-305E	UI/UX Design	L-T-P	Cr
		3 0 0	3

Course Objectives:

The primary objectives of this course are to deepen students' understanding of advanced data science techniques, enhance their practical skills in implementing these techniques, and develop their ability to apply data science methods to real-world problems. Students will explore complex algorithms, learn to handle large datasets, and gain experience with state-of-the-art tools and technologies in the field.

Course Outcomes:

By the end of this course, students will be able to:

1. Implement and optimize advanced machine learning algorithms and techniques.
2. Analyze and interpret complex datasets using sophisticated statistical and computational methods.
3. Apply data science methods to solve real-world problems in various domains.
4. Utilize modern tools and technologies for data processing, analysis, and visualization.
5. Evaluate the performance of different data science models and approaches, and choose the most appropriate methods for given problems.
6. Communicate their findings effectively using data visualization and reporting techniques.

Unit-wise Syllabus:

Unit 1: Advanced Machine Learning Algorithms

This unit covers a range of advanced machine learning algorithms beyond the basics, including ensemble methods such as random forests and gradient boosting machines, as well as support vector machines and neural networks. The unit will delve into algorithmic complexity, model tuning, and performance evaluation.

Unit 2: Deep Learning and Neural Networks

This unit introduces deep learning concepts, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative adversarial networks (GANs). Students will learn about architectures, training techniques, and applications of deep learning in various fields such as image and speech processing.

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Unit 3: Big Data Technologies and Tools

Students will explore big data technologies, including Hadoop, Spark, and distributed computing frameworks. The unit emphasizes data storage solutions, data processing pipelines, and the handling of large-scale datasets. Practical experience with these tools will be provided through hands-on labs.

Unit 4: Statistical Methods and Advanced Analytics

This unit covers advanced statistical methods and techniques for data analysis, including Bayesian inference, time series analysis, and multivariate statistics. Students will learn to apply these methods to extract insights and make predictions from complex data sets.

Unit 5: Data Visualization and Communication

Effective data visualization techniques will be covered, including interactive dashboards and visual storytelling. The unit will focus on best practices for presenting data insights, creating meaningful visualizations, and effectively communicating findings to stakeholders.

Unit 6: Ethical Issues and Data Privacy

The final unit addresses the ethical implications of data science, including data privacy, security concerns, and responsible use of data. Students will explore case studies and learn to navigate the ethical challenges associated with data collection, analysis, and reporting.

Suggested Textbooks:

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
2. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
3. "Big Data: Principles and Paradigms" by Rajkumar Buyya, et al.
4. "The Elements of Statistical Learning: Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
5. "Data Visualization: A Practical Introduction" by Kieran Healy

Reference Books:

1. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
2. "Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani
3. "Hadoop: The Definitive Guide" by Tom White
4. "Bayesian Data Analysis" by Andrew Gelman, et al.
5. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett

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