

# LINGAYA'S VIDYAPEETH



**School of Computer Applications**

## Scheme & Syllabus Of BCA

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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 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										Year : 1 <sup>st</sup>					
										Semester : I					
SN	Category	Course Code	Course Name	Periods			Credits			Theory			Practical		Subject Total Marks
				L	T	P				A B Q	M S E	E S E	I P	E X P	
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	HSM C	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	-	-	-	6	40	100		
9	PEC	EC-158	Digital Electronics Lab	0	0	2	1	-	-	-	6	40	100		
10	PCC	BCA-155E	Internet and Web Development Lab	0	0	2	1	-	-	-	6	40	100		
11			YOGA	0	0	0	0								
			Total	21	0	6	24								

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

School : School of Computer Applications											Batch : 2024 – 27		
Course : BCA											Year : 1 <sup>st</sup>		
											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 Systems	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	Database 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						

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

School : School of Computer Applications											Batch : 2024 – 27		
Course: BCA											Year : 2 <sup>nd</sup>		
											Semester : III		
SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		AB Q	MSE	ESE	IP	EX P	
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-207E	Introduction to E-commerce	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-209E	Web Technology & Services	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-259E	Web Technology & Services 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
<b>Total</b>				<b>20</b>	<b>0</b>	<b>8</b>	<b>24</b>						

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**SCHEME OF STUDIES**  
**SESSION: 2025-26**

School : School of Computer Applications											Batch : 2024 – 27		
Course : BCA											Year : 2 <sup>nd</sup>		
											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
6	PEC	ABMI-CS	Academic Basket (Preference – II)	2	0	0	2	15	25	60	-	-	100
3	PCC	BCA-206E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
4	PCC	BCA-208E	Mobile Application Development	3	0	0	3	15	25	60	-	-	100
5	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	PCC	BCA-260E	MongoDB	0	0	4	2	-	-	-	60	40	100
9	PCC	BCA-258E	Mobile Application Development Lab	0	0	2	1	-	-	-	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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School : School of Computer Applications											Batch : 2024 – 27		
Course : BCA											Year : 3 <sup>rd</sup>		
											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-305E	VB.net	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-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	PEC	BCA-355E	VB.Net Lab	0	0	2	1	-	-	-	60	40	100
11	PROJ	PROJ-391E	Major Project	0	0	8	4	-	-	-	60	40	100
12	PEC	PEC-CS-301E	MOOC Course-II (NPTEL)	2	0	0	2	-	-	-	-	-	100
Total				23	0	14	30						

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<b>Course : BCA</b>								<b>Year : 3<sup>rd</sup></b>					
								<b>Semester : VI</b>					
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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**SESSION: 2024-27**

	Code	Subjects
Elective-I	BCAE-202E	Data Warehousing & Mining
	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

**1<sup>st</sup> Semester**

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**2<sup>nd</sup> Semester**

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Course : BCA										Year : 1 <sup>st</sup>			
										Semester : I			
SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		A B Q	M S E	E S E	I P	E X P	
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	HSM C	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	-	-	-	6 0	40	100
9	PEC	EC-158	Digital Electronics Lab	0	0	2	1	-	-	-	6 0	40	100
10	PCC	BCA-155E	Internet and Web Development Lab	0	0	2	1	-	-	-	6 0	40	100
11			YOGA	0	0	0	0						
			Total	2	0	6	24						

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SESSION: 2024-25**

School : School of Computer Applications											Batch : 2024 – 27		
Course : BCA											Year : 1 <sup>st</sup>		
											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 Systems	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	Database 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						

<b>BCA-101E</b>	<b>FUNDAMENTALS OF COMPUTER SYSTEMS &amp; EMERGING TECHNOLOGY</b>	<b>L-T-P</b>	<b>Credits</b>
		<b>3-0-0</b>	<b>3</b>

### **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, 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 / Pop up Menu / Toolbar, Shutdown / Reboot, / Restart, Syntax / Wild Card Characters, Optical Fibre (Fibre Optics), Net Meeting, UPS, Printing Speed (CPS, CPM, LPM, DPI, PPM) Peripherals

#### **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](https://www.tutorialspoint.com/computer_fundamentals/index.htm)
3. [https://www.tutorialspoint.com/computer\\_fundamentals/computer\\_fundamentals\\_tutorial.pdf](https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf)
4. [http://www.kvadilabad.org/admin/downloads/1788662251computer\\_fundamentals\\_tutorial.pdf](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.

## **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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choose to know

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.

## **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 slope 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;  $\epsilon$ - $\delta$  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.

## UNIT IV

### **APPLICATIONS OF DIFFERENTIATION & PARTIAL DIFFERENTIATION:**

Asymptotes; Concavity, convexity and points of inflection; Curvature; Extrema; elementary 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; Evolute & Envelope; Volumes and surface areas of solids of revolution.

### **TEXT BOOK:**

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

### **REFERENCE BOOKS**

1. Weir, M. D., Hass, J. and Giordano, F. R., "Thomas Calculus", 11<sup>th</sup> Edition, 2012, Pearson Education.
2. Jain, R.K. and Iyengar, S.R.K., " Advance Engineering Mathematics" ,3<sup>rd</sup> 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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<b>HSS-107</b>	<b>ENGLISH &amp; COMMUNICATION SKILLS</b>	<b>L-T-P</b>	<b>Cr.</b>
		<b>3-0-0</b>	<b>3</b>

### **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 ENGLISH:** 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.

**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.

## **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:**

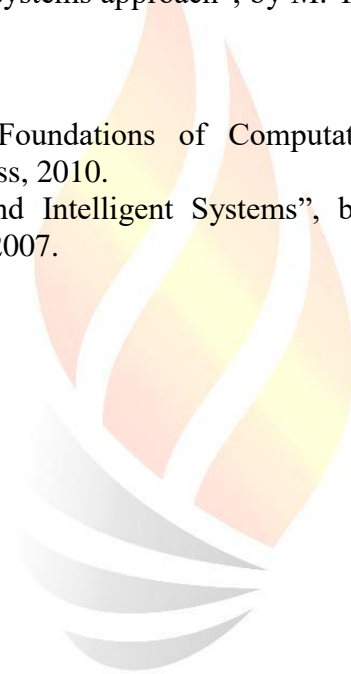
What is intelligence? Structure of intelligent system-Biological brain -Basic neural model-Intelligent Agents- Rationality- Agent Environment- Agent architectures-the concept of rationality-The structure of agent-The impact of AI in human labor-AI and the social equality.

## **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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<b>BCA-153E</b>	<b>PROBLEM SOLVING USING C LAB</b>	<b>L-T-P</b>	<b>Cr.</b>
		<b>0-0-2</b>	<b>1</b>

## **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.

### **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 in 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.



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

<b>BCA-102E</b>	<b>OPERATING SYSTEM</b>	<b>L T P</b>	<b>Cr</b>
		<b>3-0-0</b>	<b>3</b>

### 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**

**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 Principles, 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

**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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<b>BCA-106E</b>	<b>DATA STRUCTURE USING C++</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>3-0-0</b>	<b>3</b>

### **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.

### **UNIT IV**

choose to know

**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, Sartaj Sahni, “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 ( $\wedge$ ), OR ( $\vee$ ), NOT ( $\sim$ ), 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

## **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", 5<sup>th</sup> 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 I operator, Logical or Boolean operator, Assignment, Operator, Ternary operator ,Bit wise operator, Increment or Decrement operator).

## **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.org](http://www.python.org)2010
3. Allen Downey, Jeffrey Elkner, Chris Meyers ,How to think like a computer scientist :Learning with Python, Freely available online.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, Propositional 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,

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 Programmers' 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.
- Mineral 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.

- 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

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:** Create 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.

- 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.



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 identify 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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<b>BCA-154E</b>	<b>DATABASE MANAGEMENT SYSTEM LAB</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>0-0-2</b>	<b>1</b>

## **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.

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 is eligible for voting or not

### CONDITIONAL CONTROL STATEMENTS

11. Write a program to find greatest 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. Write a program to make a basic calculator

### LOOP CONTROL STATEMENTS

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 and 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 whether the string is palindrome or not

### **FUNCTIONS**

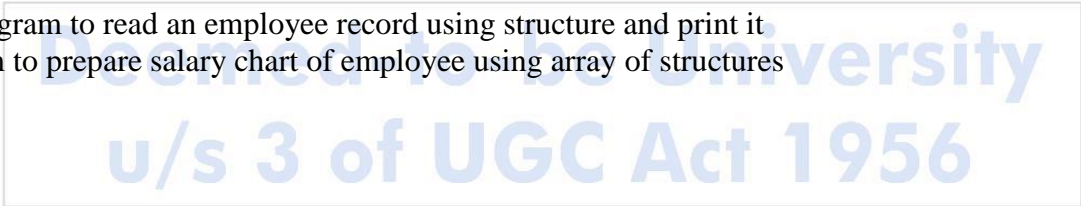
32. Write a program using function to find the largest of three numbers
33. Write a program using function to swap two numbers using call by value
34. Write a program using function to swap two numbers using call by reference
35. Write a program using function to sum the digits of a number
36. Write 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. Write a program to calculate the area and perimeter of circle using pointers
40. Write 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**

**3<sup>rd</sup> Semester**

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# 4<sup>th</sup> Semester



School : School of Computer Applications								Batch : 2024 – 27					
Course: BCA								Year : 2 <sup>nd</sup>					
								Semester : III					
SN	Category	Course Code	Course Name	Periods			Credits	Theory			Practical		Subject Total Marks
				L	T	P		AB Q	MSE	ESE	IP	EX P	
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-207E	Introduction to E-commerce	3	0	0	3	15	25	60	-	-	100
5	PCC	BCA-209E	Web Technology & Services	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-259E	Web Technology & Services 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						



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

<b>School : School of Computer Applications</b>										<b>Batch : 2024 – 27</b>			
<b>Course : BCA</b>										<b>Year : 2<sup>nd</sup></b>			
										<b>Semester : IV</b>			
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
6	PEC	ABMI-CS	Academic Basket (Preference – II)	2	0	0	2	15	25	60	-	-	100
3	PCC	BCA-206E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
4	PCC	BCA-208E	Mobile Application Development	3	0	0	3	15	25	60	-	-	100

5	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	PCC	BCA-260E	MongoDB	0	0	4	2	-	-	-	60	40	100
9	PCC	BCA-258E	Mobile Application Development Lab	0	0	2	1	-	-	-	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

<b>BCA-201E</b>	<b>COMPUTER ARCHITECTURE AND ORGANIZATION</b>										<b>L T P</b>	<b>Cr</b>	
											<b>3-0-0</b>	<b>3</b>	
			Total	18	1	12	25						

## **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

## **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 from 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.

## **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 Statements - 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.

### **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.

#### **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.

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BCA-207E	INTRODUCTION TO E-COMMERCE	L T P	Cr
		3 0 0	3

## OBJECTIVES

The objective of this course is to understand the process of electronic commerce and familiarizes students with the technology involved in it.

## COURSE OUTCOMES

**C01:** Enhance knowledge on the theoretical and practical aspects of Accounts and E- business.

**C02:** Acquire the practical exposure on internet and web design applications to perform the e-business transactions.

**C03:** Get the training to learn how to develop and deploy successful performance applications and increase the productivity of the e-business.

**C04:** Obtain the practical application exposure on e-business ventures.

**C05:** Apply object oriented or non-object-oriented techniques to solve e-business computing problems which make students a good programmer.

## UNIT - I

**An Overview of E-Commerce:** Definitions: E-commerce, E-business, difference between E-commerce and E-business, Problems with Traditional business systems, Aims of E-commerce, Types of E-commerce: B2B, B2C, C2C, B2G, G2H, G2C, Operational & Strategic benefits of E-commerce, Issues & Challenges in E-commerce. Electronic Data Interchange (EDI): Definition; Traditional versus EDI enabled system for document exchange; Components of EDI: EDI Standards, EDI Software, Communication Networks; EDI Message Structure; EDI Notification Structure; EDI in India; EDI enabled procurement process; Benefits of EDI: Direct Benefits, Strategic Benefits; EDI Implementation issues; Legal Aspects

## UNIT - II

**Web based E-Commerce:** Definition; Need for web based business, Steps in setting up business on Internet: Selection & registration of domain name, Website development : Planning a website, Steps for creating a website, Elements of a webpage, web authoring tools, Hosting a website: Website hosting considerations. Online Promotion tools & techniques: Getting links to your site, banner advertisements & measuring advertisement effectiveness; Web Traffic Analysis: Hits, View pages, Visits and Other web-reporting tools, various measures, What is Search Engine optimization

## UNIT - III



**Electronic Payment Systems:** E-cash: Purchasing & using of e-cash; Electronic Purses their loading with cash and use; E-cheque payment system; Online Third Party Verified Payment System through Credit & Debit Cards; ATM based cash disbursement system; Electronic Bill Payment System; Inter Bank clearing system.

#### **UNIT - IV**

**Mobile Commerce:** Definition, Benefits of Mobile Commerce, Issues in Mobile Commerce, Mobile Commerce Framework Applications of E-Commerce & Case Studies: Applications of e-commerce, Case studies in Retailing, Banking and e-governance; Cyber Crimes: Types, Cyber Forensics, Cyber Crimes and IT Act - 2000.

#### **References:**

1. Bhasker, Bharat: Electronic Commerce: Framework, Technologies and Applications; Tata McGraw- Hill.
2. Bajaj, Kamlesh & Nag, Debjani: E-Commerce-The Cutting Edge of Business; Tata McGraw- Hill.
3. Young, Margaret Levine : The Complete Reference: Internet; Tata McGraw Hill.
4. KalaKota, Ravi & Whinston, Andrew B.: Frontiers of Electronic Commerce; Addison Wesley.
5. Stallings, William: Network Security Essentials: Applications & Standards; Pearson Education.
6. Minoli, Daniel & Minoli, Emma: Web Commerce Technology Handbook; Tata McGraw Hill.
7. Murthy CSV: e-Commerce: Concepts, Models, Strategies; Himalayas Publishing House.
8. Kosiur, David: Understanding E-Commerce; Microsoft Press.

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BCA-209E	WEB TECHNOLOGY AND SERVICES	L T P	Cr
		3 0 0	3

## **OBJECTIVES**

This course will enable the student to build and publish web sites using HTML, DHTML, CSS, JavaScript and Dreamweaver.

## **COURSE OBJECTIVES**

**C01:** To acquire the basic knowledge on Internet

**C02:** To enable the students on gaining the knowledge on HTML

**C03:** To impart knowledge on applying the various tools

**C04:** To gain knowledge on working with web page

**C05:** To apply the frames in web page

## **UNIT - I**

**Basic Terminology:** Web Server; Web Client/Browser, Understanding how a Browser communicates with a Web Server, Website, Webpage, Static Website, Dynamic Website, Internet, Intranet, Extranet, WWW, URL

**HTML:** Structure of an HTML program, Paragraph Breaks, Line Breaks; Emphasizing Material in a Web Page (Heading Styles, Drawing Lines); Text Styles (Bold, Italics, Underline); Other Text Effects (Centering (Text, Images etc.) Lists: Unordered List, Ordered Lists, Definition lists Adding Graphics to HTML Documents using the Border, Width, Height, Align, ALT Attributes Tables: Caption Tag, Width, Border, Cell padding, Cell spacing, BGCOLOR, COLSPAN and ROWSPAN Attributes.

## **UNIT - II**

**Linking Documents:** Anchor tag, External Document References, Internal Document References and Image Maps

**Frames:** Introduction to Frames: The tag, The tag, Targeting Named Frames

**DHTML:** Introduction to cascading style sheets (CSS), Style tag, Link tag, Types of CSS: In-Line, Internal, External

**Forms:** Attributes of Form element, Input element, The Text Element, Password, Button, Submit Button, Reset Button, The Checkbox, Radio, TextArea, Select and Option , Bootstrap Library.

### **UNIT - III**

**Java Script:** Introduction and Features of JavaScript, Writing JavaScript into HTML, tokens, data types, variables, operations, control constructs, strings arrays, functions, core language objects, client side objects, event handling. Applications related to client side form validation.

Other Built-In Objects in JavaScript: The String Object, The Math Object, The Date Object

### **Unit -IV**

**SOUNDS AND VIDEOS:** Sounds and Videos – Link to a Sound – Sound Considerations – Embedded Sound – Extended Video – Video Considerations – Internal Video – Introduction to Forms – Set up a Form – Text Box – Large Text Area – Check Boxes – Radio Buttons – Menu – Upload Files – Submit and Reset Button – Hidden Field – Organize Form Elements – Label From Elements – Introduction to Frames – Creating Frames – Frame Considerations – Provide Alternative Information – Link to a Frame - Scroll Bars – Resizing Frames – Frame Borders – Frame Margins – Nested Framesets – Inline Frame.

#### **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

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<b>BCA-211E</b>	<b>DESIGN ANALYSIS &amp; ALGORITHM</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>3-0-0</b>	<b>3</b>

## **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.

## **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.

### **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



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<b>BCA-259E</b>	<b>WEB TECHNOLOGY AND SERVICES LAB</b>	<b>L T P</b>	<b>Cr</b>
		<b>0 0 2</b>	<b>1</b>

## **OBJECTIVES**

To introduce concepts of designing dynamic web pages using HTML, CSS and Javascript. To familiarize with JSP programming and master database access using JSP and JDBC. To impart PHP programming and master database access using PHP and MySQL.

## **COURSE OUTCOMES**

C01: design dynamic web pages using HTML, CSS and JavaScript.

C02: access and Validate form data using JavaScript and PHP.

C03: connect to database using JSP and JDBC and perform various operations.

C04: connect to MySQL using PHP and perform various operations

## **LIST OF EXPERIMENTS**

Q.1) Design a web page using different text formatting tags.

Q.2) Design a web page with different types of marquee.

Q.3) Design a webpage with links to different pages and allow navigation between pages.

Q.4) Design a web page with Image and Imagemaps.

Q.5) Create a student table with the following fields. Student Id, Name, DOB, Course, Address, E-mail id and apply Embedded cascading style sheet CSS with the following attributes:Font size, color, style, bold, italic, border color, set the background image & set the center align of table & text.

Q.6) Create an external CSS for above and apply to the web page.

Q.7) Create a frameset that divides browser window into horizontal and vertical framesets.

Q.8) Write the javascript code to enter five numbers in the prompt box. Calculate addition of the numbers & average.

Q.9) Create a web page with image and text apply javascript Mouse events – onmouseover, onmouseout, onclick on the image and text.

Q.10) Create a page which displays Javascript popupboxes : 1. Alert 2. Confirm 3. Prompt.

Q.11) Design a form and validate all the controls placed on the form using JavaScript.

Q.12) Create a web site with Minimum 3 pages Home, Page 1 and Page 2 Incorporate all HTML & DHTML elements The pages should be linked.

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

## 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.
- 4.
5. Write a Programs to list files in the current working directory depending upon a given pattern.
6. Create a text field that allows only numeric value and in specified length.
7. 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

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**

**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”, 6<sup>th</sup> 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”, 3<sup>rd</sup> edition, Narosa, 2005.
3. Sommerville Ian, Pearson Education, “Software Engineering”, 5<sup>th</sup> edition, Addison Wesley, 1999.

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BCA-206E	ARTIFICIAL INTELLIGENCE	L T P	Cr
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### **OBJECTIVES**

To introduce about artificial intelligence approaches to problem solving, various issues involved and 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 UNCERTAINTY:** 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, Prentice 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, Prentice Hall of India, 1996.
5. Winston Patrick Henry, —Artificial Intelligence, 3rd Edition, Addison Wesley, 1992
6. Clockson & Mellish, —Programming PROLOG, 3rd Edition, Narosa Publications, 2002.

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<b>BCA-208E</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	<b>L T P</b>	<b>Cr</b>
		<b>3 0 0</b>	<b>3</b>

### **OBJECTIVES**

To make the student understand the basic concepts of mobile application development, be aware of Characteristics of mobile applications, User-interface design, basics of graphics and multimedia.

To gain knowledge about testing and publishing of Android application

### **COURSE OUTCOMES**

**C01:** To explain the basics of mobile application development

**C02:** Develop Android application with User interface, networking and animation.

**C03:** Use simulator tools to test and publish the application

### **UNIT - I**

Mobile Application Development - Mobile Applications and Device Platforms - Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Lifecycle-The Mobile Application Front-End-The Mobile Application Back-EndKey Mobile Application Services-What is Android-Android version history-Obtaining the Required Tools- Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application

### **UNIT - II**

Understanding Activities-Linking Activities Using Intents-Fragments-Displaying Notifications Understanding the Components of a Screen-Adapting to Display Orientation-Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications

### **UNIT – III**

Using Basic Views-Using Picker Views -Using List Views to Display Long Lists-Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with ViewsUsing WebView- Saving and Loading User Preferences-Persisting Data to Files-Creating and Using Databases.



#### **UNIT - IV**

Sharing Data in Android-Creating Your Own Content Providers -Using the Content ProviderSMS Messaging -Sending Email-Displaying Maps- Getting Location Data- Monitoring a Location.

#### **UNIT - V**

Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading .

#### **TEXT BOOKS**

1. Jerome DiMarzio, “Beginning Android Programming with Android Studio”, 4 thEdition.

#### **REFERENCE BOOKS**

1. Dawn Griffiths, David Griffiths, “Head First Android Development: A Brain-Friendly Guide”, 2017.

2. Neil Smyth , “Android Studio 3.0 Development Essentials: Android”, 8 th Edition.

3. Pradeep Kothari, “Android Application Development (With Kitkat Support)”, Black Book 2014.

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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

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-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".
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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<b>BCA-258E</b>	<b>MOBILE APPLICATIION DEVELOPMENT LAB</b>	<b>L T P</b>	<b>Cr</b>
		<b>0-0-2</b>	<b>1</b>

## **OBJECTIVES**

To make the student understand the basic concepts of mobile application development, be aware of Characteristics of mobile applications, User-interface design, basics of graphics and multimedia.

To gain knowledge about testing and publishing of Android application

## **COURSE OUTCOMES**

**C01:** To explain the basics of mobile application development

**C02:** Develop Android application with User interface, networking and animation.

**C03:** Use simulator tools to test and publish the application

## **LIST OF EXPERIMENTS**

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases
5. Develop an application that makes use of Notification Manager.
6. Implement an application that uses Multi-threading.
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project)

<b>PROJ-292E</b>	<b>MINOR PROJECT</b>	<b>L T P</b>	<b>Cr</b>
		<b>0-0-4</b>	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

## 5th Semester

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## 6<sup>th</sup> Semester

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School : School of Computer Applications											Batch : 2024 – 27		
Course : BCA											Year : 3 <sup>rd</sup>		
											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-305E	VB.net	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-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	PEC	BCA-355E	VB.Net Lab	0	0	2	1	-	-	-	60	40	100
11	PROJ	PROJ-391E	Major Project	0	0	8	4	-	-	-	60	40	100
12	PEC	PEC-CS-301E	MOOC Course-II (NPTEL)	2	0	0	2	-	-	-	-	-	100
			Total	23	0	14	30						

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SCHEME OF STUDIES  
SESSION: 2026-27**

<b>School : School of Computer Applications</b>								<b>Batch : 2024 – 27</b>					
<b>Course : BCA</b>								<b>Year : 3<sup>rd</sup></b>					
								<b>Semester : VI</b>					
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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<b>BCA-301E</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	<b>L T P</b>	<b>Cr</b>
		<b>3 0 0</b>	<b>3</b>

### **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.

### 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 Management, 2nd Edition, Tata McGraw Hill, 1999

### **REFERENCE BOOKS**

1. Futrell, —Software Quality & Project Management, Pearson Education, 2002.
2. Jalote Pankaj, Software Project Management, Pearson Education, 2002.
3. Gopalaswamy 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 Management, Addison Wesley, 1998
6. Maylor, —Project Management, Third Edition, 2003.
7. Demarco Tom, —Controlling Software Project Management and Measurement, Prentice Hall, 1982
8. Glib Tom and Susannah Finzi, —Principles of Software Engineering Management, Addison Wesley, 1998.

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.

### 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-305E	VB.NET	L T P	Cr
		3 0 0	3

## **OBJECTIVES**

The course is designed to enable the students to develop applications using event driven programming with VB.net (as front end) and accessing database at back end.

## **COURSE OUTCOMES**

At the end of the course, students will be able to: • Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language. • Interpret and Develop Interfaces for real-time applications. • Build custom collections and generics in C#.

## **UNIT - I**

Overview of the Visual Studio .NET IDE: Introduction to .NET Framework and the Common Language Runtime, Introduction to Visual studio.NET IDE: Menu Bar and Tool Bar, Solution Explorer, Toolbox, Using different controls of Toolbox and their commonly used properties and methods: TextBox, Label, Check Box, Radio Button, Button, Frame, List Box, Combo Box, Picture, Image, Shape, Drive, File, directory related controls, Introduction to Menus

## **UNIT - II**

Basics of VB.Net: Constants, Variables, data types, assignment operator, Operators: Arithmetic, Relational and logical operators, Assignment operators, Control structures: If, if/then/else selection structures, Select case Multiple-selection structure, While, do while, do until, For/Next repetition structure Procedures: Introduction, sub Procedures, function procedures, event procedures, commonly used Form events, msgBox function, InputBox function. Arrays and Strings: declaring and allocating Arrays, Using Strings and String functions: len, right, left, ucase, lcase, ltrim, trim; Control Arrays: Introduction, creating and using Control Arrays

## **UNIT - III**

Writing ASP .NET applications and Deploying ASP .NET Applications: Introduction to ASP.NET, Difference between ASP and ASP.NET, Understanding Web Forms, Using Validation Controls : RequiredFieldValidator, RangeValidator, CompareValidator, RegularExpressionValidator, CustomValidator, ValidationSummary; , Managing State in ASP.NET Web Applications using Session object, Cookie and Query String ,Creating ASP.NET application, Deploying ASP.NET Applications with Windows Installer, Introduction to Web Services.

## **UNIT - IV**

Accessing Data with ADO.NET: Understanding ADO.net, ADO.NET Object model: Connected model and Disconnected model, architecture, components, Understanding Provider classes, using Data Reader to read data from database, Data Adapter and Data sets, Using DataAdapter for Data Navigation and Data Manipulation, connecting to and querying a data source, using Data Grid view control with ADO.NET data sources.

### **REFERENCE BOOKS**

1. Dave Grundgeiger, Programming Visual Basic .NET, O'Reilly Publisher.
2. Michael McMillan, Object Oriented programming using Visual Basic.Net, Cambridge University Press.
3. Cameron Wakefield Henk-Evert Sonder Wei Meng Lee, VB.NET Developer's Guide, Global Knowledge, Syngress Publishing.
4. Evangelos Petroustos, Mastering Visual Basic .NET, SYBEX Publishing
5. Deitel, Visual Basic.NET How to Program, Pearson Education
6. Lowell Mauer, Teach Yourself more Visual Basic.net in 21 days, SAMS

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

## **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

### **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 Two or More Response Variables.

### **UNIT IV**

#### **VISUALIZING UNCERTAINTY:**

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 BOOKS:**

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

<b>BCA-357E</b>	<b>DATA VISUALIZATION(POWER BI) LAB</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>0 -0-2</b>	<b>1</b>

### **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

<b>BCA-353E</b>	<b>COMPUTER GRAPHICS &amp; MULTIMEDIA</b>	<b>L T P</b>	<b>Cr</b>
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	<b>LAB</b>	<b>002</b>	<b>1</b>
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## **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 Bresenham 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 Bresenham's 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
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", 2<sup>nd</sup> 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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BCA-355E	VB.NET LAB	L T P	Cr
		0 0 2	1

### **COURSE OBJECTIVES**

Provide VB .NET language skills. Provide engineering problem solving skills using structured and object oriented programming. Provide experience in project development and meeting requirements.

**Pre-requisite:** Programming experience of ‘.NET Technologies

### **COURSE OUTCOMES**

**C01:** Explain the architecture of Dot Net Technology.

**C02:** Develop single form based .simple Net applications using basic and advanced control

**C03:** Develop multiple form and menu based .Net applications

**C04:** Develop small ADO.net based database driven .Net application

**C05:** Implement and trouble shoot simple .Net Applications

### **LIST OF PRACTICALS**

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Develop an application for deploying various built-in functions in VB.NET
7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
8. Construct a console application to demonstrate the OOP Concepts
9. Develop a web application in VB.NET for dynamic Login Processing
10. Develop a Windows application with database connectivity for core-banking transactions

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.

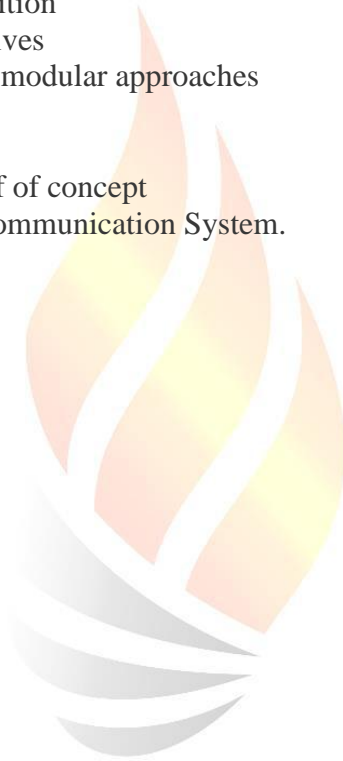
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The Major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of 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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<b>PROJ-392E</b>	<b>INTERNSHIP/ MAJOR PROJECT</b>	<b>L-T-P</b>	<b>CR</b>
		<b>0-0-40</b>	<b>20</b>

### **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.

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

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- 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-202E	Data Warehousing & Mining
	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-202E	DATA WAREHOUSING & MINING	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

**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.

**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**

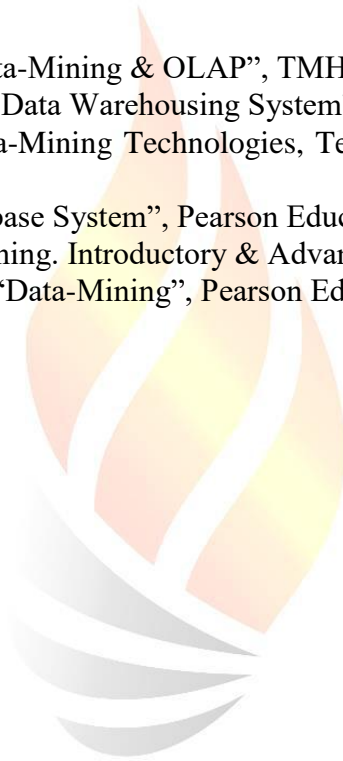
**DATA MINING TECHNIQUES:** Association rules, clustering techniques and implementation, decision tree knowledge discovery through neural networks and genetic algorithm, rough sets, support vector machines and fuzzy techniques.

### **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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<b>BCAE-204E</b>	<b>MOBILE COMPUTING</b>	<b>L-T-P</b>	<b>Cr</b>
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## **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 kit To 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

### **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, 3<sup>rd</sup> 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.



**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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choose to know

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

## 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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choose to know

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

## **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 RFID Protocols – 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.

## **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 Madiseti 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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choose to know

<b>BCAE-303E</b>	<b>DIGITAL MARKETING</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>3 0 0</b>	<b>3</b>

## **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.

## **UNIT- I**

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

Marketing; Core Concepts-Inbound Marketing, Content Marketing, Email Marketing, Influential Marketing; 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 systems credit 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.

## 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.
- Puneet Singh Bhatia- Fundamentals of Digital Marketing, Pearson Education



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choose to know

<b>BCAE-303E</b>	<b>DIGITAL MARKETING</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>3 0 0</b>	<b>3</b>

## **OBJECTIVES**

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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, Influential Marketing; 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 systems credit 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



## 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.

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6. Digital Marketing, By Dave Chaffey & Fiona Ellis-Chadwick.
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choose to know

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

### **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.

### **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