Semester-2

Type	Code	COMMUNICATIVE ENGLISH	L-T-P	Credits	Marks
CS	AECC-2		3-1-0	4	100
Topic Objective		To learn the basics of Communication. To make students proficient in it. To develop the abilities for listening, speaking, reading, and writing.			
Prerequisites		Confidence, Vocabulary, Overcoming your fear of failure, Knowledge of Grammar, Personal Communication, Professional Communication.			
Lecture Scheme		Regular lectures (classroom /virtual class with Laptop/Desktop/Smartphone) with use of ICT, lectures are planned to be interactive with focus on problem solving activities.			

Evaluation Scheme

Internal Assessment			Written Assessment	Total
Assignment(s)	Unit Test	Mid-Term (Written)	End-Term	
5	0	20	60	80

University Syllabus

Unit No	Topics	Hours
Unit-1	**Introduction:** (i) What is communication? (ii) Types of communication (Horizontal, Vertical, Interpersonal, Grapevine), (iii)Uses of Communication, Inter-cultural communication, Communication today: (iv)Distinct features of Indianisation, alternative texts of language learning, global English and English in the print and electronic media in India.	10
Unit-2	**The Four Skills and Prospect of new material in language learning:** (i) Listening-Passive and active, Speaking effective, intelligibility and clarity (ii) Methods and techniques of reading such as skimming, scanning and searching for information; Reading to understand the literal, metaphorical and suggested meaning of a passage, (iii) Identifying the tone (admiring, accusatory, ironical, sympathetic, evasive, indecisive, ambiguous, neutral etc.) of the writer and view-points. (iv) Cohesive and Coherent writing	10
Unit-3	**Grammatical and Composition Skills:** (i) Doing exercises like filling in the blanks, correcting errors, choosing correct forms out of alternative choices, joining clauses, rewriting sentences as directed, and replacing indicated sections with single words / opposites/synonyms, choosing to use correct punctuation marks, getting to understand and use formal and informal styles, learning to understand the usages of officialese, sexism,	10

	racism, jargon.. (ii) Learning to understand information structure of the sentence such as topic-focus relationship; strategies of thematization, postponement, emphasis, structural compression (deletion of redundant parts, nominalization, cleft and pseudo-cleft sentences, elliptical structures etc.), Logical Connectors between sentences, Methods of developing a paragraph, structure of an essay and methods of developing an essay	
Unit-4	**Exercises in Written Communication:** (i) Précis writing (ii) Note-taking skills (iii) Writing reports (iv) Guidelines and essentials of official correspondence for making enquiries, complaints and replies (v) Making representations; writing letters of application for jobs; writing CV, writing letters to the editor and social appeals in the form of letters/pamphlets.	10
	Total (Hours)	40

Text Books:

1. Communication Skills in English AICTE Prescribed Textbook (English) DIP122EN. By Anjan Tiwari. Publisher: Khanna Publishing; First Edition(1 January 2022)

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Students will review the grammatical forms of English and the use of these forms in specific communicative contexts, which include: class activities, homework assignments, reading of texts and writing.
CO2	Students will develop reading skills and reading speed. Students will read university texts and expand their vocabulary.
CO3	Students will develop reading skills and reading speed. Students will read university texts and expand their vocabulary.
CO4	Students will read for intensive information retrieval and interpretation required by university studies. Students will develop abilities as critical thinkers, readers and writer.
CO5	Students will attain and enhance competence in the four modes of literacy: writing, speaking, reading & listening. Students will write 3 summaries in which they will communicate appropriately, accurately and effectively what has been read.

Program Outcomes Relevant to the Course:

PO1	**Knowledge Adaption:** Ability to apply knowledge of computing appropriate to the discipline.
PO2	**Problem Analysis:** Ability to analyze a problem and identify and define the computing requirements appropriate to its solution.
PO3	**Design and Development:** Design system processes (components) that cater the exact needs of complex IT problems with background knowledge and intelligence on the need of hour
PO4	**Team Work** : Ability to function effectively on teams to accomplish a common goal.
PO5	**Ethics and Social Responsibilities:** Understanding of professional, ethical, legal, security and social issues and responsibilities.
PO6	**Effective Communication:** Ability to communicate effectively with a range of audience

PO7	**Computing Analysis Skill:** Ability to analyze the local and global impact of computing on individuals, organizations and society.
PO8	**Professional Ethics:** Recognition of the need for ability to engage in continuing professional development
PO9	**To keep abreast of technology:** Ability to use current techniques, skills and tools necessary for computing techniques.
PO10	**Coding Competency from Theory/Algorithms:** Ability to apply algorithmic principles and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
PO11	**Complexity Analysis:** Ability to apply design and development principles in the construction of software systems of varying complexity.

Type	**Code**	**LESSON PLAN**	**L-T-P**	**Credits**	**Marks**
Lecture No	Unit No	**COMMUNICATIVE ENGLISH**	3-1-0	4	80
Lecture01	1	**Topic:** What is communication **Ref:** https://www.commonsensemedia.org/articles/what-is-communication OR1;OR2;OR3;OR4;OR5;			
Lecture 02	1	**Topic:** Types of communication **Ref:** https://www.valamis.com/hub/types-of-communication OR1;OR2;OR3;OR4;OR5;			
Lecture 03	1	**Topic:** Horizontal, Vertical, Interpersonal, Grapevine **Ref:**https://study.com/academy/lesson/horizontal-communication-definition-advantages-disadvantages-examples.html OR1;OR2;OR3;OR4;OR5;			
Lecture04	1	**Topic:**Vertical **Ref:**https://harappa.education/harappa-diaries/what-is-vertical-communication/ OR1;OR2;OR3;OR4;OR5;			
Lecture 05	1	**Topic:** Interpersonal **Ref:** https://www.simplilearn.com/what-is-interpersonal-communication-article OR1;OR2;OR3;OR4;OR5;			
Lecture 06	1	**Topic:** Grapevine **Ref:** https://www.iedunote.com/grapevine OR1;OR2;OR3;OR4;OR5;			
Lecture 07	1	**Topic:** Uses of Communication **Ref:**https://law.dypvp.edu.in/blogs/importance-of-communication-and-its-process OR1;OR2;OR3;OR4;OR5;			
Lecture 08	1	**Topic:** Inter-cultural communication, Communication today **Ref:** https://ehlion.com/magazine/intercultural-communication/ OR1;OR2;OR3;OR4;OR5;			
Lecture 09	1	**Topic:** Distinct features of Indianisation, alternative texts of language learning, **Ref:** http://ignited.in/I/a/305136 OR1;OR2;OR3;OR4;OR5;			
Lecture 10	1	Topic: global English and English in the print and electronic media in India **Ref:** https://ukdiss.com/examples/esl-learners-print-electronic-media.php OR2;OR3;OR4;OR5;			

Lecture 11	2	**Topic:** The Four Skills and Prospect of new material in language learning **Ref:** https://preply.com/en/blog/the-main-4-skills-to-learn-a-language/ OR1;OR2;OR3;OR4;OR5;
Lecture 12	2	**Topic:** Listening-Passive and active **Ref:**https://www.indeed.com/career-advice/career-development/passive-vs-active-listening OR1;OR2;OR3;OR4;OR5;
Lecture 13	2	**Topic:** Speaking effective **Ref:**https://www.xsoftskills.com/2020/03/how-to-develop-effective-speaking-skills.html OR1;OR2;OR3;OR4;OR5;
Lecture 14	2	**Topic:** intelligibility and clarity **Ref:** https://en.wikipedia.org/wiki/Intelligibility_(communication) OR1;OR2;OR3;OR4;OR5;
Lecture 15	2	**Topic:** Methods and techniques of reading such as skimming **Ref:**https://www.angliaeducation.org/practical-reading-techniques-skimming-and-scanning/ OR1;OR2;OR3;OR4;OR5;
Lecture 16	2	**Topic:** scanning and searching for information, Reading to understand the literal **Ref:**https://www.utc.edu/enrollment-management-and-student-affairs/center-for-academic-support-and-advisement/tips-for-academic-success/skimming OR1;OR2;OR3;OR4;OR5;
Lecture 17	2	**Topic:** Identifying the tone (admiring, accusatory, ironical, sympathetic) **Ref:**https://www.utc.edu/enrollment-management-and-student-affairs/center-for-academic-support-and-advisement/tips-for-academic-success/skimming OR1;OR2;OR3;OR4;OR5;
Lecture 18	2	**Topic:** Identifying the tone (evasive, indecisive, ambiguous, neutral etc.) of the writer and view-points **Ref:** https://bodheeprep.com/tones-rc-passages-cat-exam OR1;OR2;OR3;OR4;OR5;
Lecture 19	2	**Topic:** Cohesive writing **Ref:** https://www.eapfoundation.com/writing/cohesion/ OR1;OR2;OR3;OR4;OR5;
Lecture 20	2	**Topic:** Coherent writing **Ref:**https://study.com/academy/lesson/coherence-in-writing-definition-examples.html OR1;OR2;OR3;OR4;OR5;
Lecture 21	3	**Topic:** Grammatical and Composition Skills: Doing exercises like filling in the blanks, correcting errors **Ref:** https://www.first-learn.com/english-grammar-and-composition.html OR1;OR2;OR3;OR4;OR5;
Lecture 22	3	**Topic:** choosing correct forms out of alternative choices, joining clauses **Ref:** https://www.first-learn.com/english-grammar-and-composition.html OR1;OR2;OR3;OR4;OR5;
Lecture 23	3	**Topic:** rewriting sentences as directed, and replacing indicated sections with single words / opposites/synonyms **Ref:** https://www.englishgrammar.org/rewrite-directed-3/

		OR1;OR2;OR3;OR4;OR5;
Lecture 24	3	**Topic:** choosing to use correct punctuation marks, getting to understand and use formal and informal styles **Ref:** https://www.englishgrammar.org/rewrite-directed-3/ OR1;OR2;OR3;OR4;OR5;
Lecture 25	3	**Topic:** learning to understand the usages of officialese, sexism, racism, jargon **Ref:** https://en.wikipedia.org/wiki/Officialese OR1;OR2;OR3;OR4;OR5;
Lecture 26	3	**Topic:** Learning to understand information structure of the sentence such as topic-focus relationship; strategies of thematization **Ref:** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4491328/ OR1;OR2;OR3;OR4;OR5;
Lecture 27	3	**Topic:** postponement, emphasis **Ref:** https://www.collinsdictionary.com/dictionary/english/postponement OR1;OR2;OR3;OR4;OR5;
Lecture 28	3	**Topic:** structural compression (deletion of redundant parts, nominalization, cleft and pseudo-cleft sentences, elliptical structures etc.) **Ref:** https://www.collinsdictionary.com/dictionary/english/postponement OR1;OR2;OR3;OR4;OR5;
Lecture 29	3	**Topic:** Logical Connectors between sentences, Methods of developing a paragraph **Ref:** https://staff.washington.edu/marynell/grammar/logicalconnectors.html OR1;OR2;OR3;OR4;OR5;
Lecture 30	3	**Topic:** structure of an essay and methods of developing an essay **Ref:**https://www.grammarly.com/blog/essay-structure/?gclid=EAIaIQobChMI_c3YrPiM_AIVRg4rCh3-ygBCEAAYASAAEgLVYPD_BwE&gclsrc=aw.ds OR1;OR2;OR3;OR4;OR5;
Lecture 31	4	**Topic:** Exercises in Written Communication: Précis writing Ref: https://leverageedu.com/blog/precis-writing OR1;OR2;OR3;OR4;OR5;
Lecture 32	4	**Topic:** Précis writing **Ref:** https://leverageedu.com/blog/precis-writing/ OR1;OR2;OR3;OR4;OR5;
Lecture 33	4	**Topic:** Note-taking skills **Ref:** https://www.student.unsw.edu.au/notetaking-tips OR1;OR2;OR3;OR4;OR5;
Lecture 34	4	**Topic:** Note-taking skills **Ref:** https://www.student.unsw.edu.au/notetaking-tips OR1;OR2;OR3;OR4;OR5;
Lecture 35	4	**Topic:** Writing reports **Ref:** https://www.grammarly.com/blog/how-to-write-a-report/ OR1;OR2;OR3;OR4;OR5;
Lecture 36	4	**Topic:** Writing reports **Ref:** https://www.grammarly.com/blog/how-to-write-a-report/ OR1;OR2;OR3;OR4;OR5;

Lecture 37	4	**Topic:** Guidelines and essentials of official correspondence for making enquiries, complaints and replies **Ref:**https://in.indeed.com/career-advice/career-development/how-to-write-a-letter-of-inquiry OR1;OR2;OR3;OR4;OR5;
Lecture 38	4	**Topic:**Guidelines and essentials of official correspondence for making enquiries, complaints and replies **Ref:**https://in.indeed.com/career-advice/career-development/how-to-write-a-letter-of-inquiry OR1;OR2;OR3;OR4;OR5;
Lecture 39	4	**Topic:** Making representations; writing letters of application for jobs; writing CV **Ref:**https://dictionary.cambridge.org/dictionary/english/make-representations-a-representation-to OR1;OR2;OR3;OR4;OR5;
Lecture 40	4	**Topic:** writing letters to the editor and social appeals in the form of letters/pamphlets **Ref:** https://www.toppr.com/guides/english/letter-writing/letter-to-editor-format/ OR1;OR2;OR3;OR4;OR5;

Type	Code	Computer Organization	L-T-P	Credits	Marks
	CORE-5		3-1-0	4	75
Topic Objective	The objective of this course is tostudy the basic organization of digital computers (CPU, memory, I/O, software) and To have a better understanding and utilization of digital computers.To be familiar with Assembly Language Programming.				
Prerequisites	Basic analytical, logical, problem solving skills with basic knowledge and usage of computers is required for this course. Prior experience in Digital logic is beneficial.				
Lecture Scheme	Regular lectures (classroom/virtual class with computer/Smartphone) with use of ICT as and when required, lectures areplanned to be interactive with focus on problem solving activities.				

Evaluation Scheme

Internal Assessment			Written Assessment	Total
Assignment(s)	Unit Test	Mid-Term (Written)	End-Term	
		15	60	75

University Syllabus

Unit No	Topics	Hours
Unit-1	Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software. Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Overflow of Integer Arithmetic, Floating-Point Numbers & Operations, Characters, Memory Locations and Addresses, Byte Addressability, Word Alignment, Accessing Numbers, Characters, and Character Strings, Memory Operations, Instructions and Instruction Sequencing, Register Transfer Notation, Basic Instruction Types, Instruction Execution and Straight-Line Sequencing, Branching, Condition Codes, Generating Memory Addresses, Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers, Indexing and Arrays, Relative Addressing.	10
Unit-2	Basic Processing Unit: Register Transfers, Performance on Arithmetic or Logic Operation, fetching a Word from Memory, Storing a Word in Memory. Execution of a Complete Instruction, Branch Instruction, Multiple Bus Organization Hardwired Control, A Complete Processor. Microprogrammed Control: Microinstructions, Microprogram Sequencing, WideBranch Addressing, Microinstructions with Next-Address Field, Prefetching Microinstructions, Emulation. Cache Memories: Mapping Functions, Replacement Algorithms, Example of Mapping Technique. Performance Considerations: Interleaving, Hit Rate and Miss Penalty, Caches on Processor Chip, Other Enhancements, Virtual Memories: Address Translation.	10
Unit-3	Input/ Output Organization: Accessing I/O Devices, Interrupts, Interrupt Hardware, Enabling & Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions. Direct Memory Access, Bus Arbitration, Buses, Synchronous Bus, Asynchronous Bus, Interface Circuits: Parallel Port, Serial Port, Standard I/O Interfaces, Peripheral Component Interconnect (PCI) Bus, SCSI Bus, Universal Serial Bus (USB)	10
Unit-4	Pipelining: Role of Cache Memory, Pipeline Performance, Data Hazards: Operand	10

	Forwarding, Handling Data Hazards in Software, Side Effects. Instruction Hazards: Unconditional Branches, Conditional Branches and Branch Prediction. Influence on Instruction Sets: Addressing Modes, Condition Codes, Data path and Control Considerations. Superscalar Operation: Out-of-Order Execution, Execution Completion, Dispatch Operation, RISC & CISC Processors.	
	Total (Hours)	40

Text Books:

TB1: ***Carl Hamacher, Z. Vranesic, S. Zaky,*** *Computer Organization, 5/Ed (TMH)*

Reference Books:

RB1: ***William Stallings***,Computer Organization and Architecture (Design for Performance), 9/Ed

RB2: ***S. Brown, & Z. Vranesic,*** Fundamentals of Digital Logic Design with VHDL, 2/Ed, McGraw-Hill.

Online Resources:

OR1:http://www.cse.iitm.ac.in/~vplab/courses/comp_org.htm

OR2:https://nptel.ac.in/courses/106/106/106106092/

OR3:https://lecturenotes.in/notes/15742-note-for-computer-organistaion-co-by-jntu-heroes?reading=true

OR4:https://www.youtube.com/watch?v=Iir5Pz3kq0w&list=PLWPirh4EWFpF0FVeBgL75d1RlASn4sGoz

OR5:https://www.youtube.com/watch?v=ktQDGH9_PjQ

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Understand the architecture of modern computer, and also understanding of how the computer performs arithmetic operations on positive and negative numbers.
CO2	Apply knowledge of basic processing unit to control microinstructions and to different memory concepts.
CO3	Understand I/O organization to manage interrupt and use of interface circuits in computer systems.
CO4	Analyze the pipelining performance and design a pipeline for consistent execution of instructions with minimum hazards

Program Outcomes Relevant to the Course:

PO1	**Computing Knowledge**: Apply the knowledge of mathematics, science, logic, computing fundamentals to address complex problems.
PO2	**Problem Analysis:** Ability in identifying, formulating and analyzing problems to derive substantiated conclusions through the applications of complex solutions.
PO3	**Design and Development**: Create solutions and system processes tailored to address complex IT challenges, leveraging both background knowledge and relevant tools.
PO4	**Investigation Techniques**: Employ computing knowledge and methodologies, such as experimental design, data analysis, interpretation and information synthesis to draw valid conclusions.
PO5	**Utilization of Modern Technology/Tools**: Skillfully create, select and apply appropriate techniques, resources and computing tools while understanding their limitations.
PO6	**Individual and Team Work:** Proficient in both independent and collaborative work across diverse environments, including leadership roles.

PO7	**Technocrat and Society:** Utilize contextual knowledge to assess societal, legal and security issues relevant to professional practices.
PO8	**Effective Communication**: Proficient in conveying complex ideas, writing reports, creating presentations and delivering messages to diverse audience.
PO9	**Ethics**: Adhere to ethical principles and professional norms for conducting oneself in a professional context.
PO10	**Skill and Competency**: Demonstrate the ability to analyze and apply the local and global impacts of project management, while consistently upgrading skill sets and navigating design various trade-offs.
PO11	**Lifelong Learning**: Recognize the necessity and possess the readiness and capability to engage in independent and continuous learning within the evolving landscape of technology.

Mapping of COs to POs: (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3		2						2
CO2	3	3	3		3						3
CO3	3	3	3		3						3
CO4	3	3	2		3						3

Type	Code	LESSON PLAN Computer Organization	L-T-P	Credits	Marks
Lecture No	Unit No		3-1-0	4	75
Lecture 1	1	**Topic:** Introduction to design and basic structure of computer and its types. Details about its functional units. **Ref:**TB1 (1.1, 1.2); RB1 (1.1, 1.2);OR1			
Lecture 2	1	**Topic:**Connection between processor and memory, basic operational concept, Bus structures, concept of system software. **Ref:**TB1 (1.3, 1.4,1.5); RB1 (3.2, 3.4);OR1			
Lecture 3	1	**Topic:**Introduction to machine instruction, concept about number representation, Addition of Positive Numbers, Addition of Signed Numbers. **Ref:**TB1 (2.1, 2.1.1,2.1.2); RB1 (9.1-9.3,10.1);OR1			
Lecture 4	1	**Topic:**Subtraction of signed numbers and overflow of integer arithmetic. Floating-point numbers & operations, characters. **Ref:**TB1 (2,1.3, 2.1.4,2.1.5); RB1 (10.1,10.4,10.5); OR2, OR3			
Lecture 5	1	**Topic:**Storing of data in memory locations and addresses, byte addressability, word alignment, accessing numbers, characters, and character strings. **Ref:**TB1 (2.2); RB1 (8.3); OR3, OR1			
Lecture 6	1	**Topic:**Memory Operations, Instructions and Sequencing of Instructions, Register Transfer Notation, Basic Instruction Types. **Ref:**TB1 (2.3,2.4.1,2.4.3);RB1 (12.1); OR4			
Lecture 7	1	**Topic:**Instruction execution and straight-line sequencing, concepts of branching. **Ref:**TB1 (2.4.4,2.4.5); RB1 (12.2,12.4);OR5			

Lecture 8	1	**Topic:** Condition codes, generating memory addresses, addressing modes. **Ref:**TB1 (2.4.6,2.4.7); RB1 (13.1); OR2
Lecture 9	1	**Topic:**Implementation of variables and constants, indirection and pointers **Ref:**TB1 (2.5.1,2.5.2); RB1 (13.2);OR1
Lecture 10	1	**Topic:**Concept of indexing and arrays, relative addressing.. **Ref:**TB1 (2.5.3,2.5.4); RB1 (13.1); OR2
Lecture 11	2	**Topic:**Introduction to Basic Processing Unit, Concept of Register Transfers, Performance on Arithmetic or Logic Operation. **Ref:**TB1 (7.1,7.1.1,7.1.2); RB1 (17.7); OR2
Lecture 12	2	**Topic:**Process of fetching a word from memory and storing a word in memory. Basic idea about execution of a complete instruction, Branch instruction. **Ref:**TB1 (7.1.3,7.1.4,7.2);RB1 (12.4);OR1
Lecture 13	2	**Topic:**Multiple bus organization hardwired control, A complete processor. **Ref:**TB1 (7.3,7.4); RB1 (19.3); OR1
Lecture 14	2	**Topic:**Basic organization of Microprogrammed control unit, Microinstructions. **Ref:**TB1 (7.5,7.5.1); RB1 (20.1, 20.2) OR1
Lecture 15	2	**Topic:**Sequential execution ofMicroprogram, WideBranch addressing. **Ref:**TB1 (7.5.2,7.5.3); RB1 (20.3); OR3, OR2
Lecture 16	2	**Topic:**Microinstructions with next-address field, Prefetching microinstructions, Emulation. **Ref:**TB1 (7.5.4,7.5.5,7.5.6); RB1 (20.4); OR4
Lecture 17	2	**Topic:**Introduction to Cache memories, Mapping functions, replacement algorithms **Ref:**TB1 (5.5.1,5.5.2); RB1 (4.2); OR2
Lecture 18	2	**Topic:**Example of Mapping Technique. Performance Considerations, Interleaving. **Ref:**TB1 (5.5.3,5.5.4,5.6.1); RB1 (17.2); OR5
Lecture 19	2	**Topic:**Hit Rate and Miss Penalty, Caches on Processor Chip. **Ref:**TB1 (5.6.2,5.6.3); RB1 (4.4); OR5
Lecture 20	2	**Topic:**Other Enhancements, Virtual Memories: Address Translation. **Ref:**TB1 (5.6.4,5.7); RB1 (8.5); OR1
Lecture 21	3	**Topic:**Introduction to Input/ Output Organization, Accessing I/O Devices. **Ref:**TB1 (4.1); RB1 (7.3); OR2
Lecture 22	3	**Topic:**The idea of Interrupts and the hardware & software needed to support them, Enabling & Disabling Interrupts. **Ref:**TB1 (4.2,4.2.1,4.2.2); RB1 (3.2); OR3, OR2
Lecture 23	3	**Topic:**Handling Multiple Devices, Controlling Device Requests. **Ref:**TB1 (4.2.3,4.2.4); RB1 (3.3); OR3, OR5
Lecture 24	3	**Topic:**Exceptions. Direct Memory Access as an I/O mechanism for high speed devices. **Ref:**TB1 (4.2.5,4.4); RB1 (7.5); OR1
Lecture 25	3	**Topic:**Bus Arbitration, Buses. **Ref:**TB1 (4.4.1,4.5); RB1 (3.4); OR5, OR2
Lecture 26	3	**Topic:**Data transfer over Synchronous &Asynchronous Bus. **Ref:**TB1 (4.5.1,,4.5.2); RB1 (3.4,3.5); OR4
Lecture 27	3	**Topic:**The design of I/O Interface Circuits, Parallel Port. **Ref:**TB1 (4.6,4.6.1); RB1 (3.5); OR1
Lecture 28	3	**Topic:**Serial Port, Standard I/O Interfaces.

		Ref:TB1 (4.6.2,4.7); RB1 (3.5); OR1
Lecture 29	3	**Topic:**Commercial bus standards, Peripheral Component Interconnect (PCI) Bus,. **Ref:**TB1 (4.7.1); RB1 (3.6); OR1
Lecture 30	3	**Topic:**SCSI Bus, Universal Serial Bus (USB). **Ref:**TB1 (4.7.2,4.7.3); RB1 (14.4); OR1
Lecture 31	4	**Topic:**Basic concept of Pipelining, Role of Cache Memory. **Ref:**TB1 (8.1,8.1.1); RB1 (17.1, 17.3) OR4
Lecture 32	4	**Topic:**Pipeline Performance, Various Data Hazards that cause performance degradation. **Ref:**TB1 (8.1.2,8.2); RB1 (18.1); OR3
Lecture 33	4	**Topic:**Operand Forwarding, Handling Data Hazards in Software. **Ref:**TB1 (8.2.1,8.2.2); RB1 (18.2); OR5
Lecture 34	4	**Topic:**Side Effects. Instruction Hazards,Unconditional Branches. **Ref:**TB1 (8.2.3,8.3,8.3.1); RB1 (14.4);OR2
Lecture 35	4	**Topic:**Conditional Branches and Branch Prediction. **Ref:**TB1 (8.3.2); RB1 (14.5); OR2
Lecture 36	4	**Topic:**Influence of pipelining on Instruction Sets, Addressing Modes. **Ref:**TB1 (8.4,8.4.1); RB1 (13.1); OR3
Lecture 37	4	**Topic:**Condition Codes, Data path and Control Considerations. **Ref:**TB1 (8.4.2,8.5); RB1 (12.5); OR4
Lecture 38	4	**Topic:**Superscalar Operation, Out-of-Order Execution. **Ref:**TB1 (8.6.1);RB1 (16.2); OR2
Lecture 39	4	**Topic:**Execution Completion, Dispatch Operation. **Ref:**TB1 (8.6.2,8.6.3); RB1 (16.3); OR5
Lecture 40	4	**Topic:**Basic concept of RISC & CISC Processors and its implementation. **Ref:**TB1 (1.6.5,11.1); RB1 (16.4,16.5)page no:545,568; OR1

BCA-2

SN	Code	Paper	Credit	No. of Classes	L-T-P	Marks MT-ET-PRTL-(T)	Faculty	Deadline
1	Core-4	Data Structure	4+2	40+20	3-1-2	15-60-25-(100)	Mr. C Sethi	

Type	Code	DataStructure	L-T-P	Credits	Marks
	CORE-4		3-1-2	4+2	100
Topic Objective		To learn how the choice of data structures impacts the performance of programs. To study specific data structures such as arrays, linear lists, stacks, queues, binary trees, binary search trees, heaps and AVL tree. To learn efficient searching and sorting techniques.			
Prerequisites		Problem solving ability, Basic knowledge in C/C++ programming language (Array, Function, Structure, and Pointer), Mathematics (Basic knowledge in Number Theory, Linear Algebra, Graph Theory)and basic knowledge in pseudocode.			
Lecture Scheme		Regular lectures (classroom/virtual class with Laptop/Desktop/Smartphone) with use of ICT,lectures areplanned to be interactive with focus on problem solving activities.			

Evaluation Scheme

Mid-Term (Written)	End-Term	Practical	Total
15	60	25	100

University Syllabus

Unit No	Topics	Hours
Unit-1	**Introduction:** Basic Terminology, Data structure, Time and space complexity, Review of Array, Structures, Pointers. **Linked Lists:** Dynamic memory allocation, representation, Linked list insertion anddeletion, Searching, Traversing in a list, Doubly linked list, Sparse matrices.	**10**
Unit-2	**Stack:** Definition, Representation, Stack operations, Applications (Infix–Prefix–Postfix Conversion& Evaluation, Recursion). **Queues:** Definition, Representation, Types of queue, Queue operations, Applications.	**10**
Unit-3	**Trees:** Tree Terminologies, General Tree, Binary Tree, Representations, Traversing, BST, Operations on BST, Heap tree, AVL Search Trees, M-way search tree, Applications of all trees.	**10**
Unit-4	**Sorting:** Exchange sorts, Selection Sort, Bubble sort, Insertion Sorts, Merge Sort, Quick Sort, Radix Sort, Heap sort. **Searching:** Linear search, Binary search.	**10**
	Total (Hours)	**40**

Text book:

TB:D. Samanta , “Classic Data Structure,” PHI , 2/ed.

Reference Books:

RB1:*Ellis Horowitz*,SartajSahni, “Fundamentals of Data Structures,”Galgotia Publications, 2000.

RB2:*Sastry C. V., Nayak R, Ch, Rajaramesh*, “Data Structure and Algorithms,” I. K. International Publishing House Pvt. Ltd., New Delhi.

Online Resources:
OR1:https//nptel.ac.in/courses/
OR2: https://www.educba.com/data-vs-information/
OR3:https://afteracademy.com/blog/time-and-space-compexity-analysis-of-algorithm
OR4: https://www.udemy.com/topic/data-structures/free/
OR5:https://www.geeksforgeeks.org/data-structures/

Type	Code	LESSON PLAN	L-T-P	Credits	Marks
Lecture No	Unit No	**Data Structures**	3-1-2	4+2	100
Lecture01	1	**Topic:** Introduction to Data Structure, What is Data? What is Information? Difference between Data and Information, Basic Terminology: Data, Information, Data Type, Abstract Data Type (ADT). **Ref:**TB (1.1, 1.2,1.3,pg1-6); OR1;OR2;OR3;OR4;OR5;			
Lecture 02	1	**Topic:**Classification of Data Structure: Linear Data Structure & Non-linear Data Structure; Definition of Algorithms, Flowchart of Algorithms, What do you mean by a good algorithm, Time and space complexity: Best Case, Worst Case Average Case, Ω notation, Θ notation, O notation. **Ref:**TB (1.1-1.3,A.1-A.16, pg6-7& pg761-771); OR1;OR2;OR3;OR4;OR5;			
Lecture 03	1	**Topic:**Review of Array: Definition, Terminology, Types of Array, Memory Representation of 1-D Array; Operations on Array: Traversing, Sorting, Searching, Insertion, Deletion, Merging; Multidimensional Arrays: Memory Representation of 2-D; Applications of Array. **Ref:**TB (2.1-2.4,pg12-24); OR1;OR2;OR3;OR4;OR5;			
Lecture 04	1	**Topic:**Structures: Defining a Structure, Declaring Structure Variable, Accessing Structure Members, Structure Initialization, Arrays of Structures, Arrays within Structures, and Structures within Structures. **Ref:**OR1;OR2;OR3;OR4;OR5;			
Lecture0 5	1	**Topic:**Pointers: Definition, Understanding Pointers, Accessing Address of a Variable, Declaring Pointer Variable, Initialization of Pointer Variable, Accessing a Variable through its Pointer, Chain of Pointers, Pointers & Arrays. **Ref:**OR1;OR2;OR3;OR4;OR5;			
Lecture0 6	1	**Topic:**Dynamic memory allocation: Introduction, Malloc, Calloc, Free,Realloc;Linked Lists:Definition, Representation of Linked List in Memory (Static Representation & Dynamic Representation) **Ref:**TB (3.1-3.2, pg36-39);OR1;OR2;OR3;OR4;OR5;			
Lecture 07	1	**Topic:**Operations on a Single Linked List:Traversing, Insertion (insert at front, insert at end, and insert at any position), Deletion (delete at front, delete at end and delete at any position of a Single Linked List). **Ref:**TB (3.2,pg40-47); OR1;OR2;OR3;OR4;OR5;			
Lecture 08	1	**Topic:**Copying a single Linked List, Merging two Single Linked Lists, Searching an element in Single Linked List, Circular Linked List: Operations on Circular Linked List(Searching an element and Merging two Circular Linked Lists). **Ref:**TB (3.3,pg48-54); OR1;OR2;OR3;OR4;OR5;			
Lecture 09	1	**Topic:**Doubly Linked Lists: Understanding Double Linked Lists, Operations on Double Linked Lists (inserting a node at the front, inserting a node at the end, inserting a node at any position, delete at front, delete at end, delete at any position), Circular Double Linked Lists. **Ref:**TB (3.4-3.5,pg54-62); OR1;OR2;OR3;OR4;OR5;			
Lecture 10	1	**Topic:**Applications of Linked Lists: Sparse Matrix Manipulation, Polynomial Representation (polynomial having single variable and polynomial having multiple variable), Dynamic Storage Management. **Ref:**TB (3.6,pg63-73); OR1;OR2;OR3;OR4;OR5;			

Lecture 11	2	**Topic:**Stack:Definition of Stacks, Representation of a Stacks (Array Representation of Stacks and Linked List Representation of Stacks), Stack Operations (PUSH, POP, STATUS of Array and Linked List Representations). **Ref:**TB (4.1-4.4,pg105-110); OR1;OR2;OR3;OR4;OR5;
Lecture 12	2	**Topic:**Applications of Stacks:Evaluation of Arithmetic Expressions (Notations for arithmetic expressions: Infix Notation, Prefix Notation, and Postfix Notation). **Ref:**TB (4.5.1,pg111-114); OR1;OR2;OR3;OR4;OR5;
Lecture 13	2	**Topic:**Conversion of an Infix Expression into Postfix Expression, Evaluation of a Postfix Expression. **Ref:**TB (4.5,pg115-118); OR1;OR2;OR3;OR4;OR5;
Lecture 14	2	**Topic:**Conversion of a Postfix Expression into a Code, Code Generation for Stack Machines. **Ref:**TB (4.5.1,4.5.2,pg119-123); OR1;OR2;OR3;OR4;OR5;
Lecture 15	2	**Topic:**Implementation of Recursion: Factorial Calculation. **Ref:**TB (4.5.3,pg123-127); OR1;OR2;OR3;OR4;OR5;
Lecture 16	2	**Topic:**Queues:Introduction,Definition of Queue, Representation of Queue (Using Arrays and Using Linked List), Operations on Array Representation (Enqueue, Dequeue). **Ref:**TB (5.1-5.3.1,pg153-159); OR1;OR2;OR3;OR4;OR5;
Lecture 17	2	**Topic:**Queue operations on Linked List Representation (Enqueue, Dequeue, And Status of the Queue), Circular Queue: Array Representation of Circular Queue, Logical and Physical Views, Operations (Enqueue, Dequeue). **Ref:**TB (5.3.2-5.4.1,pg159-164); OR1;OR2;OR3;OR4;OR5;
Lecture 18	2	**Topic:**Deque: Introduction, Definition, Operations (Push, Pop, Inject, Eject). **Ref:**TB (5.4.2,pg164-166); OR1;OR2;OR3;OR4;OR5;
Lecture 19	2	**Topic:**Priority Queue: Introduction, Definition, Priority queue using an Array, Multi-queue Implementation, and Linked List Representation of a Priority Queue. **Ref:**TB (5.4.3,pg167-172); OR1;OR2;OR3;OR4;OR5;
Lecture 20	2	**Topic:**Applications of Queue: Simulation, CPU Scheduling in a Multiprogramming Environment. **Ref:**TB (5.5.1-5.5.2,pg172-186); OR1;OR2;OR3;OR4;OR5;
Lecture 21	3	**Topic:**Trees:Introduction, Basic Terminologies, Definition and Concepts of General Tree. **Ref:**TB (7.1-7.2,pg212-216); OR1;OR2;OR3;OR4;OR5;
Lecture 22	3	**Topic:**Binary Trees: Definition of Binary Tree, Full Binary Tree, Complete Binary Tree, Properties of a Binary Tree, Representations (Linear Representation, Advantages and Disadvantages of Linear/Sequential Representation, Linked Representation) Operations on Binary Trees. **Ref:**TB (7.2.1-7.4.2,pg217-237); OR1;OR2;OR3;OR4;OR5;
Lecture 23	3	**Topic:**Traversals: Inorder Traversal, Preorder Traversal, Postorder Traversal, Non-recursive Implementation of Traversal algorithms, **Ref:**TB (7.4.3,pg237-243); OR1;OR2;OR3;OR4;OR5;
Lecture 24	3	**Topic:**Formation of Binary Tree from its Traversals (Formation from Inorder& Preorder, Inorder&Postorder, and Preorder &Postorder), Merging Together Two Binary Trees. **Ref:**TB (7.4.3-7.4.4,pg243-249); OR1;OR2;OR3;OR4;OR5;
Lecture 25	3	**Topic:**Binary Search Tree: Definition of Binary Search Tree, Operations on BST (Searching a BST, Inserting a Node into a BST, Deleting a Node from a BST), Traversals on BST, And Applications of BST. **Ref:**TB (7.5.2,pg254-265); OR1;OR2;OR3;OR4;OR5;
Lecture 26	3	**Topic:**Heap trees: Definition, Representation of a Heap Tree, Operations on a Heap Tree (Insert a Node into a Heap Tree, Delete a Node from a Heap Tree, Merging Two Heap Trees, and Applications of Heap Trees. **Ref:**TB (7.5.3,pg266-275); OR1;OR2;OR3;OR4;OR5;
Lecture 27	3	**Topic:**Height Balanced Binary Tree: Definition, AVL Rotations (Case1, Case2, Case3, Case4). **Ref:**TB (7.5.5,pg289-298); OR1;OR2;OR3;OR4;OR5;
Lecture 28	3	**Topic:**Implementation for Height Balancing a Tree, Height of a Height Balanced Binary Tree. **Ref:**TB (7.5.5,pg299-306); OR1;OR2;OR3;OR4;OR5;

Lecture 29	3	**Topic:**M-way search tree: Definition, B Trees, B Tree Indexing, Operations on B Tree(Searching, Inserting, Deleting) Lower and Upper Bound of a B Tree. **Ref:**TB (7.7-7.7.3,pg375-401); OR1;OR2;OR3;OR4;OR5;
Lecture 30	3	**Topic:**B+ Tree Indexing: Definition, Operations on B+ Tree Indexing (Searching, Insertion, Deletion), B Tree vs. B+ Tree. **Ref:**TB (7.8,pg401-403); OR1;OR2;OR3;OR4;OR5;
Lecture 31	4	**Topic:**Sorting:Introduction, Basic Terminologies, Sorting Techniques (Sorting by Comparison and Sorting by Distribution). **Ref:**TB (10.1-10.2,pg528-532); OR1;OR2;OR3;OR4;OR5;
Lecture 32	4	**Topic:**Sorting by Insertion: Straight Insertion Sorts, List Insertion Sort, Binary Insertion Sort, and Two-Way Insertion Sort. **Ref:**TB (10.1-10.2,pg532-553); OR1;OR2;OR3;OR4;OR5;
Lecture 33	4	**Topic:**Sorting by Selection: Straight Selection Sort, Tree Selection Sort. **Ref:**TB (10.4-10.4.2,pg554-572); OR1;OR2;OR3;OR4;OR5;
Lecture 34	4	**Topic:**Heap sort: Introduction, Heap Tree (Max Heap, Min Heap), Sorting using Heap Tree, Create Heap, Remove Max, and Rebuild Heap. **Ref:**TB (10.4.3,pg573-591); OR1;OR2;OR3;OR4;OR5;
Lecture 35	4	**Topic:**Sorting by Exchange: Introduction, Bubble sort (Concept and Example) **Ref:**TB (10.5.1,pg593-599); OR1;OR2;OR3;OR4;OR5;
Lecture 36	4	**Topic:**Quick Sort: Introduction, Divide-and-Conquer, Divide-and-Conquer Approach in Quick Sort, Partition Method in Quick Sort. **Ref:**TB (10.5.4,pg612-629); OR1;OR2;OR3;OR4;OR5;
Lecture 37	4	**Topic:**Sorting by Distribution: Introduction, Radix Sort. **Ref:**TB (10.6-10.6.1,pg636-642); OR1;OR2;OR3;OR4;OR5;
Lecture 38	4	**Topic:**Sorting by Merging: Simple Merging, Binary Merge, Merge Sort (Internal Merge Sort and External Merge Sort). **Ref:**TB (10.7-10.7.7,pg658-687); OR1;OR2;OR3;OR4;OR5;
Lecture 39	4	**Topic:**Searching:Introduction, Basic Terminologies, Linear search Techniques (Sequential Search with Arrays, Sequential Search with Linked List. **Ref:**TB (11.1-11.2.2,pg712-720); OR1;OR2;OR3;OR4;OR5;
Lecture 40	4	**Topic:**Non-linear Search Techniques: Introduction, Binary Tree Searching, BST Searching. **Ref:**TB (11.3-11.3.2,pg738-751); OR1;OR2;OR3;OR4;OR5;

BS	GE-IC-2	LESSON PLAN	L-T-P	Credits	Marks
Lecture No	Unit No	(Statistics)	3-1-0	4	75
Lecture 1	1	Topic: Floating point representation, **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 2	1	Computer arithmetic of Floating point representation **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 3	1	Significant digits **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 4	1	Errors: Round-off error **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 5	1	Local truncation error, Global truncation error **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 6	1	Order of a method **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 7	1	Convergence and terminal conditions **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 8	1	Efficient computations **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis)			
Lecture 9	2	Basic Concepts of finding roots of an equation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 10	2	Bisection method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 11	2	Secant method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 12	2	Regula−Falsi method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 13	2	Newton−Raphson method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 14	2	Newton's method for solving nonlinear systems **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 15	2	Newton's method for solving nonlinear systems (continue) **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 16	3	Introduction to Interpolation: **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 17	3	Lagrange"s Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 18	3	Newton"s Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 19	3	Finite difference operators **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 20	3	Gregory Newton forward differences Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 21	3	Gregory Newton backward differences Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			

Lecture 22	3	Piecewise polynomial interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 23	3	Piecewise polynomial interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 24	3	Linear interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 25	3	Linear interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 26	4	Introduction to Numerical integration **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 27	4	Numerical integration by Trapezoid rule **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 28	4	Numerical integration by Simpson's rule (only method) **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 29	4	Numerical integration by Newton−Cotes formulas **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 30	4	Numerical integration by Gaussian quadrature **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 31	4	Introduction to Ordinary differential equation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 32	4	Euler‟s method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 33	4	Modified Euler‟s methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 34	4	Modified Euler‟s methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 35	4	Runge-Kutta second methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7