Scheme of Teaching and Evaluation for

B.Tech– III & IV Semester

Computer Science & Engg.

(2023 Scheme)

B.E. in Computer Science & Engineering Scheme of Teaching and Examinations – 2023 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2024-25)

III SEMESTER

SN	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	23MAT31	Applied Mathematics for Computer Science Engineering.	H & S	3	0	0		03	50	50	100	3
2	IPCC	23CS32	Digital System Design and Computer Organization	CSE	3	0	2		03	50	50	100	4
3	IPCC	23CS33	Operating System	CSE	3	0	2		03	50	50	100	4
4	PCC	23CS34	Data Structures and Applications	CSE	3	0	0		03	50	50	100	3
5	PCCL	23CSL35	Data Structures Lab	CSE	0	0	2		03	50	50	100	1
6	ESC	23CS36	ESC/ETC/PLC Object Oriented Programming With JAVA	CSE	3	0	0		03	50	50	100	3
7	UHV	23SC37	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC/ SEC	23CS38X	Ability Enhancement Course - III	CSE	If the course is a Theory: 1	0	0		01	50	50	100	1
					If the course is a Laboratory: 0	0	2		02				
9	MC	23NS39	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		23PE39	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		23YO39	Yoga	Yoga Teacher									
Total										**550**	**350**	**900**	**20**

Ability Enhancement Course – III			
23CS381	Unix and Shell Programming	23CS382	Version Controller with GiT
23CS383	R Programming		

SN	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	23MATDIPS31	ADDITIONAL MATHEMATICS-I	H & S	3	0	0		03	100	00	100	0

IV SEMESTER

SN	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	23BB41	Biology for Engineers	H & S	3	0	0		03	50	50	100	3
2	IPCC	23CS42	Micro Controllers and Embedded System	CSE	3	0	2		03	50	50	100	4
3	IPCC	23CS43	Database Management Systems	CSE	3	0	2		03	50	50	100	4
4	PCC	23CS44	Analysis and Design of Algorithms	CSE	3	0	0		03	50	50	100	3
5	PCCL	23CSL45	Algorithms Lab	CSE	0	0	2		03	50	50	100	1
6	ESC	23CS46X	ESC/ETC/PLC	CSE	3	0	0		03	50	50	100	3
7	AEC/ SEC	23PSW47	Professional Skills for the Work Place	H & S	If the course is a Theory: 1	0	0		01	50	50	100	1
					If the course is a Laboratory: 0	0	2		02				
8	UHV	23UH48	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	MC	23NS49	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		23PE49	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		23YO49	Yoga	Yoga Teacher									
Total										**500**	**400**	**900**	**20**

Engineering Science Course (ESC/ETC/PLC)			
23CS461	System Software	23CS462	Object Oriented Programming with Python
23CS463	Introduction to Data Analytics		

SN	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	23MATDIP41	ADDITIONAL MATHEMATICS-II	MATHS	3	0	0		03	100	00	100	0

Scheme of Teaching and Evaluation for

B.Tech– III Semester

Computer Science & Engg.

(2023 Scheme)

SEMESTER: III

Course Name: Applied Mathematics for Computer Science and Engineering

Course Code:	23MAT31	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	3:0:0	Total Marks	100
Credits	03	Exam Hours	03

Pre-requisites:

1. Definition of a set, operations on sets and definitions of different types of functions.
2. Basic concepts of Probability, Addition and Multiplication theorem.

Course objectives:

1. To study Propositional logic.
2. To find the association between attributes and the correlation between two variables.
3. Aims to provide essential concepts of elementary probability theory.
4. Students will achieve command of the fundamental definitions and concepts of graph theory
5. To introduce the concept of Trees and prefix codes.

Module – 1: Mathematical Logic **06 Hours**

Logical connectives: Disjunction, Conjunction, Negation, Exclusive Disjunction Conditional and Bi-conditional statements. Laws of logic, Tautologies and contradictions, Logical Equivalence, Duality, Converse, inverse and contra positive. Rules of inference, open statements and Quantifiers.

Self-Study: Logical gates,

Applications: Finite state machines, in determining the correctness of proof. Database querying, AI (rules in knowledge base), Cryptography (analysing security, security proofs, crypto analysis)
(RBT Levels: L1, L2 and L3)

Module – 2: Curve Fitting, Correlation and regressions **07 Hours**

Principles of least squares, Curve fitting by the method of least squares: fitting a straight line in the form $y = ax + b$, *fitting a parabola in the form of* $y = ax^2 + bx + c$ and fitting a geometrical curve in the form of $y = ax^b$. Correlation, Co-efficient of correlation, lines of regression. Angle between regressions lines, rank correlation.

Self- Study: Fitting of curves in the form $y = ae^{bx}$, $y = ab^x$.

Applications: To fit the given data into different curves, Algorithm optimization, AI- feature engineering , model optimization, performance evaluation, Predictive modeling, Software Reliability.
(RBT Levels: L1, L2 and L3)

Module – 3: Probability **10 Hours**

Probability distributions: Review of probability theory. Random variables, discrete and continuous random variables, probability mass density function. Mean and variance of Binomial and Poisson distribution (with proof) and Normal distribution (without proof)- Problems.

Joint probability distribution: Joint probability distribution for two discrete random variables, expectation, covariance and correlation.

Self-study: Baye's theorem.

Applications: Control Engineering, operation research, testing and quality control, Querying theory(Network traffic), Game Development, Genetic algorithms (modelling crossover and mutation probabilities)
(RBT Levels: L1, L2 and L3)

Module –4: Introduction to Graph Theory **09 Hours**

Definition of degree, graph, incidence, Sub graphs, connected graphs, complete graph, Complement of a graph, Graph Homomorphism and Isomorphism. Bipartite graphs, Walks, cycles and paths, Hamiltonian and Euler Circuits. Planar graphs, Euler's formula with proof, Dual of a planar graph.
Self-Study: The Konigsberg bridge problem.
Applications: Internet field. Google maps, webpage searching, Computer networks (multipath routing, network optimization, distance vector, link state protocols)
(RBT Levels: L1, L2 and L3)

Module – 5: Trees and their Properties **08 Hours**

Definitions of a tree, Properties of trees, connected trees, Minimally connected graphs. Theorems on Trees (with proof) such as. "A tree with n vertices has (n-1) edges". "Any connected graph with n vertices and (n-1) edges is a tree". "A connected graph is a tree if and only if it is minimally connected". and Examples, Routed trees, Weighted Trees and Prefix Codes.
Self-Study: Sorting technique.
Applications: Representing hierarchical data, and providing efficient algorithms for operations such as insertion, deletion, and searching, File Systems, XML/HTML DOM, Decision Trees, Compiler design (AST), Database indexing.
(RBT Levels: L1, L2 and L3)

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	"Graph Theory: With Application to Engineering and Computer Science",	Narsingh Deo,	Prentice Hall of India,	16th Edition.2003.
2	"Graph Theory Applications"	L.R.Foulds ,	Springer	10th Edn.2016
3	Foundation of Discrete Mathematics	K D Joshi	*New* Age Publishers, Ltd	10th Edition, 2014
4	Discrete and Combinatorial Mathematics	Ralph P. Grimaldi	Pearson Education.Inc.	5th Edition,2011.
5	Engineering Mathematics	N P Bali, Dr. Manish Goyal	Laxmi Publications	Volume II
Reference Books				
1	Discrete Mathematical structures and Graph theory	Dr D.S.Chandrase kharaiah.	Prism Books Pvt Ltd	6th Edition , 2019.
2	Discrete Mathematics and its applications	Kenneth H. Rosen	Tata Mcgraw-Hill,	7th Edition,2012
3.	Higher Engineering Mathematics	B. S. Grewal	Khanna Publications, 44 th Ed.,	2021
	References from Grewal Textbook Module-2: Curve fitting Introduction Pg. no.: 812(24.1) Fitting a parabola- Pg. no.: 825(24.8) Module-3:Probabiltity Introduction pg. no. 857(26.1), Random Variables pg. no.: 871(26.7), Poissons distribution pg.no. 882(26.15) Binomial Distribution pg. no.: 879(26.14)			

Course Outcomes: at the end of Course students will be able to

CO 1: Will be able to test Validity of an Argument.
CO 2: Apply the correlation and regression analysis to fit a suitable mathematical model for the statistical data.

CO 3: Will be able to apply binomial, poisons and normal distributions.

CO 4: Apply the basic concepts of graph theory and judge the planarity of graphs.

CO 5: Apply prefix codes and determine optimal prefix code.
E-Resources:

1. http://nptel.ac.in/courses/111106050/13.
2. https://www.youtube.com/watch?v=5TgonnFaDkA.
3. https://www.youtube.com/watch?v=u71Up-m5NBQ.
4. https://www.youtube.com/watch?v=oU60TuGHxe0&list=PL0862D1A947252D20&index=11.
5. https://www.youtube.com/watch?v=_BIKq9Xo_5A&list=PL0862D1A947252D20&index= 13.
6. https://www.youtube.com/watch?v=7cTWea9YAJE&list=PL0862D1A947252D20&index=24.
7. https://www.youtube.com/watch?v=695iAm935cY&list=PL0862D1A947252D20&index=25.
8. https://www.youtube.com/watch?v=X0sGo7X2xHw.

https://www.youtube.com/watch?v=7FJ08NILBuA

Semester: III

Course Name: DIGITAL SYSTEM DESIGN AND COMPUTER ORGANIZATION

Course Code	**23CS32**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**40 + 20**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Pre-requisites:

1. Basic Electronics
2. Basic Structure of Computer.

Course Objectives:

1. Illustrate different simplifying techniques in the design of combinational circuits.
2. Design various combinational and sequential digital circuits.
3. Design various counters using Flip-Flops.
4. Demonstrate the fundamentals of computer organization with machine instructions.
5. Elaborate the communication of input/output devices with computer system and solve arithmetic Operations using various techniques.

Module – 1	**08 Hours**
Karnaugh Maps: minimum forms of switching functions, two and three variable Karnaugh maps, four variable Karnaugh maps, determination of minimum expressions using essential prime implicants, Quine- McCuskey Method: determination of prime implicants, the prime implicant chart, simplification using map-entered variables.	
Module -2	**08 Hours**
Multiplexers, Decoders and Programmable Logic Devices: Multiplexers, three state buffers, decoders andencoders, Programmable Logic devices.**Latches and Flip Flops:** Set Reset Latch, Gated Latches, Edge Triggered D Flip Flop, SR Flip Flop, J K FlipFlop, T Flip Flop.	
Module – 3	**08 Hours**
Register and Counters: Register and register transfers, Shift registers **Counters:** design of Binary counters, counters for other sequences, counter design using SR and J K Flip Flops.Sequential parity checker	
Module – 4	**08 Hours**
Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance–Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions andInstruction Sequencing, Addressing Modes	
Module – 5	**08 Hours**
Input/output Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-Operand Multiplication: Booth algorithm	

.

PRACTICAL COMPONENT **20 Hours**

SN	List of Experiments
1	a) Realize 3-Variable and 4-variable Boolean expressions, simplify it using K-map and Implement usingbasic gates. b) Simulate and verify the working of above expressions using VHDL
2	a) Design and implement Half adder and Full Adder using basic gates. b) Simulate and verify the working of Half adder and Full Adder using VHDL
3	a) Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplifiedlogic expression using 8:1 multiplexer. b) Simulate and verify the working of 8:1 multiplexer using VHDL
4	a) Design and implement the Binary to Gray Code converter using basic gates. b) Simulate and verify the working of Binary to Gray Code converter using VHDL
5	a) Design and implement the Truth Table of a 3-bit Parity Generator and 4-bit Parity Checker with an even parity bit using basic Gates.
6	a) Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table. b) Simulate and verify the working of D Flip-Flop with positive edge triggering using VHDL.
7	a) Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-flop ICs b) Simulate and verify the working of mod-8 up counter using VHDL.
8	a) Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9)and demonstrate on 7-segment display (using IC7447). b) Simulate and verify the working of Switched tail counter using VHDL

Course Outcomes:

1. Apply different simplifying techniques in the design of combinational circuits.
2. Design various combinational and sequential digital circuits.
3. Design various counters using Flip-Flops.
4. Describe the fundamentals of computer organization with machine instructions.
5. Elaborate the communication of input/output devices with computer system and solve arithmetic Operationsusing various techniques.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Analog and Digital Electronics	Charles H Roth and Larry L Kinney	Cengage Learning	2019
2	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	Tata McGraw Hill	5th Edition 2002
Reference Books				
1	Digital Principles and Applications,	Donald P Leach, Albert Paul Malvino & Goutam Saha	Tata McGraw Hill,	8th Edition 2015
2	Computer Organization & Architecture, Pearson	William Stallings		9th Edition

e-Resources: **http://lms.vtu.ac.in/econtent/CSE.php**

SEMESTER: III

Course Name: OPERATING SYSTEM

Course Code	**23CS33**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**40 + 20**	Exam Hours	**3**
Credits	**4**	Total Marks	**100**

Pre-requisites: The students should have the knowledge of:

1. Basics of computer system and its applications
2. Basics of computer programming

Course objectives:

1. To introduce operating system, OS responsibilities, and OS services.
2. To discuss process concept, process scheduling techniques, and multi-threading concepts.
3. To demonstrate deadlock condition in the computer system, and usage of main memory.
4. To introduce virtual memory management concepts and file system.
5. To explain about secondary storage system and Linux OS as a case study

Module-1	**08 Hours**
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; **Operating System Services:** User - Operating system interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating system structure; Virtual machines; System boot	
Module-2	**08 Hours**
Process Management Process concept; Process scheduling; Operations on processes; Inter process communication. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; thread scheduling. **Multi-threaded Programming:** Overview; Multithreading models; Thread Libraries; threading issues.	
Module-3	**08 Hours**
Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	
Module-4	**08 Hours**
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation offrames; Thrashing. **File System, Implementation of File System:** File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	

Module-5	**08 Hours**
Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Diskscheduling; Disk management; Swap space management. **Case Study:** The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	

PRACTICAL COMPONENT **20 Hours**

SN	List of Experiments
1	Install an operating system on a physical or logical (virtual) machine.
2	Design, develop and implement program to simulate the working of Shortest Remaining Time First scheduling algorithm. Experiment with different length jobs.
3	Design, develop and implement program to simulate the working of Round Robin (RR) scheduling algorithms. Experiment with different quantum sizes for RR algorithm.
4	Design, develop and implement a Banker's algorithm. Assume suitable input required to demonstrate the results.
5	Design, develop and implement page replacement using FIFO algorithms. Assume suitable input required to demonstrate the results.
6	Design, develop and implement page replacement using LRU algorithms. Assume suitable input required to demonstrate the results.
7	Design, develop and implement optimal page replacement algorithms. Assume suitable input required to demonstrate the results.

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

1. Analyze the need, responsibilities, and services of OS.
2. Compare different process scheduling techniques.
3. Examine deadlock situation, prevention, avoidance and recovery.
4. Implement virtual memory management concept and file system.
5. Demonstrate the structure of secondary storage and design of Linux OS.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	Wiley-India	7th edition, , 2006
Reference Books				
1	Operating Systems: A Concept Based Approach	D.M Dhamdhere	McGraw- Hill	3rd Ed, , 2013.
2	An Introduction to Operating Systems: Concepts and Practice	P.C.P. Bhatt	PHI(EEE)	4th Edition, 2014

E-Resources:

https://www.operating-system.org/
https://blog.feedspot.com/operating_system_blogs/
https://www.youtube.com/playlist?list=PLhqPDa2HoaAZLws7PFYWl4MnzCyHf8do- https://medium.com/javarevisited/6-best-operating-system-courses-for-beginners-to-learn-7d727882d267

SEMESTER: III

Course Name: DATA STRUCTURES AND APPLICATIONS

Course Code	**23CS34**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**3**	Exam Hours	**03**

Course objectives:

1. Explain the fundamentals of data structures and their applications to solve real life problems.
2. Demonstrate the working of linear and nonlinear data structures.
3. Write solutions to problems using linear data structures and nonlinear data structures.
4. Apply different data structures to solve given problem.
5. Develop skills to apply appropriate data structures in problem solving.

Module -1	**08Hours**
Review of C Language: Arrays, Structures & Unions, Pointers and Dynamic memory allocation **Introduction to Data Structures:** Classifications of Data Structures, Data structure operations: Traversing, inserting, deleting, searching and sorting. **Applications:** Representation of Polynomials and Sparse Matrices	
Module -2	**08Hours**
Stacks: Stack Operations, Array Representation of Stacks, Different types of expression: Infix, Postfix and Prefix.**Stack Applications:** Infix to postfix conversion, Infix to prefix conversion, Evaluation of postfix expression, Recursion. **Queues:** Array Representation of Queues, Queue Operations, Circular Queues, Queues and Circular queues usingDynamic arrays, Dequeues, Priority Queues.	
Module -3	**08Hours**
Linked Lists: Classification of linked lists. Representation of different types of linked lists in Memory. Traversing, Insertion, Deletion, Searching, Sorting and Concatenation Operations on Singly linked list. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. **Applications of Linked lists** – Polynomials, Sparse matrix representation.	
Module -4	**08Hours**
Trees 1: Terminologies, Binary Trees, Properties of Binary trees, Array and linked Representation of BinaryTrees, Binary Tree Traversals - Inorder, postorder, preorder; **Threaded binary trees** **Binary Search Trees:** Binary Search Trees, Insertion, Deletion, Traversal and Searching operations on Binarysearch tree. Application of Trees: - Evaluation of Expression	
Module -5	**08Hours**
Graphs: Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth FirstSearch and Depth First Search.	

Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

Course Outcomes:

1. Identify types of data structures and use them to solve problems
2. Demonstrate the applications of various data structures
3. Apply the data structures to solve problems.
4. Compare solutions of a given problem using different data structures
5. Choose appropriate data structures to solve real world problems

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Data Structures: A Pseudo-code approach with C	Gilberg and Forouzan	Cengage Learning	2nd Ed, 2014
2	Fundamentals of Data Structures in C	Ellis Horowitz and SartajSahni	Universities Press	2nd Ed, 2014
Reference Books				
1	Data Structures using C	ReemaThareja	Oxford press	3rd Ed 2012
2	Data Structures using C	A M Tenenbaum	PHI	2001

SEMESTER: III

Course Name: DATA STRUCTURES LAB

Course Code	**23CSL35**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**20**	Total Marks	**100**
Credits	**1**	Exam Hours	**03**

Course Objectives:

1. Illustrate implementation of basic operations on data structures.
2. Interpret Applications of different data structures.
3. Demonstrate data structures and their variants.
4. Illustrate various searching techniques using trees and graphs.
5. Develop skills to identify appropriate data structures to solve a given problem.

List of Experiments:

Identify the functional requirements, then Design and Develop solutions to the problems related to the datastructures

1. Stacks and Queues
2. Linked list
3. Trees
4. Graphs
5. Hashing techniques

Course outcomes:

1. Design programs to implement basic operations on data structures.
2. Apply different data structures to solve problems.
3. Develop programs to demonstrate variants of queues and linked list
4. Implement various Searching techniques using trees and graphs.
5. Choose appropriate data structures to solve a given problem.

SEMESTER: III

Course Name: OBJECT ORIENTED PROGRAMMING WITH JAVA

Course Code	**23CS36**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Pre-requisites: Students should know the knowledge on:

1. **C Programming**
2. **C++**

Course Objectives:

1. Learn fundamental features of object-oriented language and JAVA.
2. Learn object-oriented concepts using programming examples.
3. Study the concepts of importing packages, exception handling mechanism and multithreading.
4. Introduce Applets and Threads mechanism.

Module-1	**08 Hours**
Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. **Data types and other tokens:** Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects. Access specifiers.	
Module-2	**08 Hours**
Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; **Control Statements:** Selection statements, iteration statements, Jump Statements	
Module-3	**08 Hours**
Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; **Inheritance:** Simple, multiple, and multilevel inheritance; interfaces; Overriding, overloading. **Exception handling:** Exception handling in Java.	
Module-4	**08 Hours**
The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets.	
Module-5	**08 Hours**
Multi-Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread.	

Course Outcomes:

1. Identify classes, objects, members of a class and relationship among them needed for a specific problem.
2. Implement reusability Programs in JAVA using inheritance.
3. Develop JAVA Programs of error handling techniques using exception handling.
4. Apply the concepts of Applets and Threads to develop GUI programs.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Java The Complete Reference	Herbert Schildt	The McGraw Hill	8thEdition, 2015
Reference Books				
1	Programming with Java	Mahesh Bhave and Sunil Patekar	Pearson Education	1st Edition, 2008
2	Programming with Java A prim	E Balagurusamy	Tata McGraw Hill	3rd Edition, 2007

e-Resources:

How to install java:-*https://youtu.be/IJ-PJbvJBGs*

JavaSwings:-*https://youtu.be/TwMXA1S38qg*

Java Quiz:-https://www.w3schools.com/java/java_quiz.asp
Java Concepts:-https://www.javatpoint.com/java-tutorial
ProgrammingExercises:-https://www.programiz.com/java-programming/examples

SEMESTER: III

Course Name: SOCIAL CONNECT & RESPONSIBILITY

Course Code	**23SC37**	CIE Marks	**100**
Teaching Hours / Week (L:T:P: S)	**0:0:2**	SEE Marks	**--**
Total Hours of Pedagogy	**40 hour Practical Session +15hour Planning**	Total Marks	**100**
Examination nature (No SEE – Only CIE)	For CIE Assessment - Activities Report Evaluation by College NSSOfficer / HOD / Sports Dept. / Any Dept.		
Credits	**01 – Credit**		

Course objectives:

The course will enable the students to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. Create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem –solving.
5. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practicalsolutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizingcommunity participation to acquire leadership qualities and democratic attitudes.

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connectwith fellow human beings, nature, society, and the world at large. The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, andsemester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Contents
Part I: **Plantation and adoption of a tree:** Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONETREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.
Part II : **Heritage walk and crafts corner:** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - Objectives,Visit, Case Study, Report, Outcomes.
Part III : **Organic farming and waste management:** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus
Objectives, Visit, Case Study, export, Outcomes. **Part IV: Water conservation:** Knowing the present practices in the surrounding villages and implementation in the campus, documentary orphotoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.
Part V :

Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, casestudy, report, outcomes.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Communicate and connect to the surrounding.
CO2: Create a responsible connection with the society.
CO3: Involve in the community in general in which they work.
CO4: Notice the needs and problems of the community and involve them in problem –solving.
CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in findingpractical solutions to individual and community problems.
CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizingcommunity participation to acquire leadership qualities and democratic attitudes.

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fineart.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs / social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

DURATION:

A total of 40 - 50 hours engagement per semester is required for the 3rd semester of the B.E. / B.Tech. program. Thestudents will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors has to design the evaluation systemas per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:
Continuous Internal Evaluation (CIE):

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor / s to indicate what he has observed and learned in the social connect period. The reportshould be signed by the mentor. The report shall be evaluated on the basis of the following criteria and / or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information / Data collected during the social connect Analysis of the information / data and report writing considering all above points allotting the marks as mentioned below

Excellent: 80 to 100
Good: 60 to 79

Satisfactory: 40 to 59
Unsatisfactory and fail: <39

Special Note:

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences,location and time of execution.

SN	Topic	Group size	Location	Activity Execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land / parks / Villages / roadside / community area / College campus etc.	Site Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages / City Areas / Grama panchayat / public associations / Government Schemes officers / campus etc.	Site Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside / community area / College campus etc.	Group Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages / City Areas / Grama panchayat / public associations / Government Schemes	Site Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation	Evaluation as per the rubrics Of scheme and syllabus by Faculty

			officers / campus etc.		authority	
5.	Food walk: Practices insociety	May be individual or team	Villages / City Areas / Grama panchayat / public associations / Government Schemes officers / campus etc.	Group Selection / Proper Consultation A/ Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

SN	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study based Assessment, Individual performance
9	Sector / Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progressand its completion.
- At last consolidated report of all activities, compiled report should be submitted as per the instructions andscheme.

SEMESTER: III

Course Name: UNIX AND SHELL PROGRAMMING

Course Code	**23CS381**	CIE Marks	**50**
Teaching Hours/Week (L: T :P)	**1:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**15**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

Pre-requisites:
Knowledge of DOS and Windows

Module-1	**03 Hours**
Introduction, Brief history, Unix Architecture, Features of Unix, locating commands, Command structure, Internaland External commands, man command, Understanding the man documentation, Basic commands such as cal, date, echo, printf, passwd, who, wc, ls.	
Module-2	**03 Hours**
Unix files: Basic file types, Parent-child relationship, the home directory, PATH variable. Relative and absolutepathnames. Directory commands – pwd, cd, mkdir, rmdir commands,File related commands – cat, cp, rm, mv	
Module-3	**03 Hours**
File Types & Permission: The ls -l command, -d options, File ownership, File permissions, chmod, and Directory permissions, changing Fileownership. **The vi editor:** Different modes of vi, Input mode commands, Command mode commands, ex-mode commands,Repeat command, Pattern searching, Search and Replace command.	
Module-4	**03 Hours**
The shells interpretive cycle: Wild cards, Escaping and Quoting, Three standard files and redirection, Pipe, tee, Command substitution. Shell programming: Ordinary and environment variables, read command, Command line arguments, exit and exitstatus of a command, Logical operators for conditional execution, test command and its shortcut, if, expr, while, for, and case-control statements, set and shift commands, positional parameters	
Module5	**03 Hours**
Process: Basics, Mechanism of process creation, Parent and child process, The ps command with its options,Signals, Job control. **File Links**: Hard link and soft link, umask, head, tail, cut, paste, sort and grep commands	

Course Outcomes:

1. Demonstrate the architecture and salient features of UNIX OS.
2. Understand UNIX Commands, Shell basic, and shell environments.
3. Create a file with vi editor and Apply changes in the file permission and ownership.
4. Design and develop shell programs using loops, and control statements.
5. Create UNIX Processes and a simple filter.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Unix Concepts and Applications	Sumitabha Das	Tata McGraw Hill	4th Edition

SEMESTER: III

Course Name: Version Controller with Git

Course Code	**23CS382**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**15**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

Pre-requisites:

- Basic knowledge of computer hardware and software
- Basic knowledge of programming

Course objectives:

1. To demonstrate the installation Git, set up their initial configuration, and comprehend the advantages anddisadvantages of using Git for version control.
2. To illustrate the concept of creating and managing Git repositories
3. To implement branching concepts of Git including creating, merging, and switching branches, enabling them toeffectively manage parallel development efforts
4. To illustrate setting up Git on a server, allowing them to facilitate collaborative development

To experiment with hosting repositories on GitHub, managing project issues there, and collaborating with others.

Module -1	**03 Hours**
Getting Started: Version Control Basics, What Is Git?, Advantages Of Git, Disadvantages Of Git. The Basics:Installing Git, First Time Git Set Up, Tips And Troubleshooting	
Module -2	**03 Hours**
Working with Repositories: What Are Git Repositories?, Recording Changes To Repos, Working With Remotes,Git Aliases, Tagging	
Module -3	**03 Hours**
Working with Branches: What Are Branches?, Branching And Merging,Branch Workflows, Remote Branches	
Module -4	**03 Hours**
Working with Servers: Getting Git On Server, Server Setup, Distributed Git And Projects	
Module -5	**03 Hours**
GitHub: What Is Github?, History Of Github, How To Use Github, Different Types Of Accounts	

Course Outcomes:

1. Install Git, set up their initial configuration, and comprehend the advantages and disadvantages of using Git forversion control.
2. Gain proficiency in creating and managing Git repositories
3. Implement branching concepts of Git including creating, merging, and switching branches, enabling them toeffectively manage parallel development efforts

4. Set up Git on a server, allowing them to facilitate collaborative development
5. Use GitHub as a platform for hosting repositories, tracking project issues, and collaborating with others

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Mastering Git: A Beginner's Guide	Sumanna Kaul, Shahryar Raz, and Divya Sachdeva	CRC Press	2023
Reference Books				
1	Learning Git	Anna Skoulikari	O'Reilly Media	2023
2	Git Repository Management in 30Days: Learn to manage code repositories like a pro	Sumit Jaiswal	BPB Publications	2023
3	Pro Git	Scoot Chacon	Apress	2023

e-Resources: **https://pdfdrive.to/filedownload/mastering-git-a-beginners-guide-mastering-computer-science**

SEMESTER: III

Course Name: R Programming

Course Code	**23CS383**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**15**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

Pre-requisites: Knowledge of basic computer hardware, Software and any programming language

Course objectives:

1. Explore and understand how R and R Studio interactive environment.
2. To learn and practice programming techniques using R programming.
3. Read Structured Data into R from various sources.
4. Understand the different data Structures, data types in R.
5. To develop small applications using R Programming.

Module-1	**03 Hours**
Numeric, Arithmetic, Assignment, and Vectors: R for Basic Math, Arithmetic, Variables, Functions, Vectors,Expressions and assignments Logical expressions	
Module-2	**03 Hours**
Matrices: Defining a Matrix, Sub-setting, Matrix Operations Conditions and Looping: if statements, looping with for, looping with while, vector based programming.	
Module-3	**03 Hours**
Lists and Data Frames: Data Frames, Lists: Special values, The apply family.	
Module-4	**03 Hours**
Programming with Functions -1: Functions, scope and its consequences, Arguments	
Module-5	**03 Hours**
Programming with Functions-2: Vector Based programming using functions, Recursive Programming, Debugging functions	

Course Outcomes:

1. Apply the fundamentals of R Programming to solve basic mathematical functions.
2. Design and Develop R programs using branching and iterative statements.
3. Apply critical programming concepts to solve real life problems.
4. Demonstrate R programs using functions.
5. Develop simple applications using Vector Based Programming.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC	Jones, O., Maillardet. R.and Robinson.A	The R Series.	2014
Reference Books				
1	Statistics: An Introduction using R	Michael J. Crawley	Wiley	Second edition, 2015

e-Resources:

Wickham, H. & Grolemund, G. (2018). for Data Science. O'Reilly: New York. Available for free athttp://r4ds.had.co.nz.

R programming for Beginners: **https://www.youtube.com/watch?v=fDRa82lxzaU**

SEMESTER: III

Course Name: PHYSICAL EDUCATION (SPORTS & ATHLETICS) – I

Course Code	**23PE39**	CIE	**100 Marks**
Credits: L:T:P	**0:0:2**		
Total Hours	**30 P**		

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Create a foundation for the professionals in Physical Education and Sports
4. Participate in the competition at regional / state / national / international levels.
5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining ahealthy lifestyle.

Module-1 Orientation	**05 Hours**
a. Lifestyle b. Fitness c. Food & Nutrition d. Health & Wellness e. Pre-Fitness test.	
Module II: General Fitness & Components of Fitness	**15 Hours**
a. Warming up (Free Hand exercises) b. Strength – Push-up / Pull-ups c. Speed – 30 Mtr Dash d. Agility – Shuttle Run e. Flexibility – Sit and Reach f. Cardiovascular Endurance – Harvard step Test	
Module III: Recreational Activities	**10 Hours**
a. Postural deformities. b. Stress management. c. Aerobics. d. Traditional Games.	

SEMESTER III

Course Name: YOGA FOR A BETTER LIFE (3rd to 6th)

Course Code	**23YO39**	CIE Marks	100 / Sem.
Teaching Hours / Week (L:T:P)	**0:0:2**	SEE Marks	---
Total Hours of Pedagogy per semester	**23 - 28 hours (Theory + practical)**	Total Marks	100 / Sem.
Examination nature (SEE):	**Objective type Theory / Practical / Viva-Voce**		

Course objectives:

1. To enable the student to have good health.
2. To practice mental hygiene.
3. To possess emotional stability.
4. To integrate moral values.
5. To attain higher level of consciousness.

The Health Benefits of Yoga

The benefits of various yoga techniques have been supposed to improve

- body flexibility,
- performance,
- stress reduction,
- attainment of inner peace, and
- self-realization.
- The system has been advocated as a complementary treatment to aid the healing of several ailments such as coronary heart disease, depression,anxiety disorders,asthma, and extensive rehabilitation for disorders including musculoskeletal problems and traumatic brain injury.
  - The system has also been suggested as behavioral therapy for smoking cessation and substance abuse(including alcohol abuse).
  - If you practice yoga, you may receive these physical, mental, and spiritual benefits:
- **Physical**
  1. Improved body flexibility and balance
  2. Improved cardiovascular endurance (stronger heart)
  3. Improved digestion
  4. Improved abdominal strength
  5. Enhanced overall muscular strength
  6. Relaxation of muscular strains
  7. Weight control
  8. Increased energy levels
  9. Enhanced immune system
- **Mental**
  1. Relief of stress resulting from the control of emotions
  2. Prevention and relief from stress-related disorders
  3. Intellectual enhancement, leading to improved decision-making skills
- **Spiritual**
  1. Life with meaning, purpose, and direction
  2. Inner peace and tranquility
  3. Contentment

SEMESTER III

Course Name: YOGA SYLLABUS

Yoga, its origin, history and development. Yoga, its meaning, definitions. Different schools of yoga, Aim andObjectives of yoga, importance of prayer Yogic practices for common man to promote positive health

Rules to be followed during yogic practices by practitioner Yoga its misconceptions,
Difference between yogic and non-yogic practices
Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar 12 count, 2 rounds.

Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionarymeasures and benefits of each asana

Different types of Asanas

a. Sitting: 1. Padmasana, 2. Vajrasana
b. Standing: 1. Vrikshana, 2. Trikonasana
c. Prone line: 1. Bhujangasana, 2. Shalabhasana
d. Supine line: 1. Utthitadvipadasana, 2. Ardhahalasana

Semester IV
Patanjali's Ashtanga Yoga, its need
and importance. Yama: Ahimsa,
Satya, Asteya, Brahmacarya,
Aparigraha
Niyama: Shoucha, Santosh, Tapa, Svaadhyaya, Eshvarapranidhan, Suryanamaskar12 Count- 4 Rounds of Practice

Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionarymeasures and benefits of each asana

Different types of Asanas

a. Sitting: 1. Sukhasana, 2. Paschimottanasana
b. Standing: 1. Ardhakati Chakrasana, 2. Parshva Chakrasana
c. Prone line: 1. Dhanurasana,
d. Supine line: 1. Halasana, 2. Karna Peedasana

Meaning, importance and benefits of Kapalabhati. 40 strokes / min 3 rounds
Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measuresand benefits of each Pranayama
Pranayama: 1. Suryanuloma –Viloma 2. Chandranuloma-Viloma 3. Suryabhedana, 4. Chandra Bhedana 5.Nadishodhana

SEMESTER V

Patanjali'sAshtanga Yoga its need and importance. Ashtanga Yoga
1. Asana
2. Pranayama
3. Pratyahara

Asana its meaning by name, technique, precautionary measures and benefits of each asana

Different types of Asanas
a. Sitting: 1. Ardha Ushtrasana, 2.Vakrasana, 3.Yogamudra in Padmasana
b. Standing: 1. Urdhva Hastothanasana, 2.Hastapadasana, 3.ParivrittaTrikonasana, 4.Utkatasana
c. Prone line: 1. Padangushtha Dhanurasana, 2.Poorna Bhujangasana / Rajakapotasana
d. Supine line: 1. Sarvangasana, 2.Chakraasana, 3.Navasana / Noukasana, 4.PavanamuktasanaRevision of practice 60 strokes / min 3 rounds

Meaning by name, technique, precautionary measures and benefits of each Pranayama
1. Ujjayi 2. Sheetali 3. Sheektari

SEMESTER VI

Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi
Asana by name, technique, precautionary measures and benefits of each asana

Different types of Asanas
a. Sitting: 1. Bakasana, 2.Hanumanasana, 3.Ekapada Rajakapotasana, 4.Yogamudra in Vajrasana
b. Standing: 1. Vatayanasana, 2.Garudasana, 3.
c. Balancing: 1. Veerabhadrasana, 2.Sheershasana
d. Supine line: 1. Sarvangasana, 2.Setubandha Sarvangasana, 3.Shavasanaa (Relaxation posture).

Revision of Kapalabhati practice 80 strokes / min - 3 rounds

Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama
1. Bhastrika
2. Bhramari
Meaning, Need, importance of Shatkriya. Different types. Meaning by name, technique, precautionary measures andbenefits of each Kriya 1. Jalaneti & sutraneti 2. Nouli (only for men) 3. Sheetkarma Kapalabhati

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:
- Understand the meaning, aim and objectives of Yoga.
- Perform Suryanamaskar and able to Teach its benefits.
- Understand and teach different Asanas by name, its importance, methods and benefits.
- Instruct Kapalabhati and its need and importance.
- Teach different types of Pranayama by its name, precautions, procedure and uses
- Coach different types of Kriyas, method to follow and usefulness.

Suggested Learning Resources:
Books:

1. Yogapravesha in Kannada by Ajitkumar
2. Light on Yoga by BKS Iyengar
3. Teaching Methods for Yogic practices by Dr. M L Gharote & Dr. S K Ganguly
4. Yoga Instructor Course hand book published by SVYASA University, Bengaluru
5. Yoga for Children –step by step – by Yamini Muthanna

Web links and Video Lectures (e-Resources): Refer links
https: //youtu.be/KB-TYlgd1wE
https: //youtu.be/aa-TG0Wg1Ls

Semester wise from 3rd to 6th semester

Course Name: DISTRIBUTION OF ACTIVITIES

Semester	Topics / Activities to be Covered
3rd Sem.	1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing. 2. Waste management– Public, Private and Govt organization, 5 R's. 3. Setting of the information imparting club for women leading to contribution in social andeconomic issues.
4th Sem.	4. Water conservation techniques – Role of different stakeholders– Implementation.5 5. Preparing an actionable business proposal for enhancing the village income and approach forimplementation. 6. Helping local schools to achieve good results and enhance their enrolment in Higher / technical /vocational education.
5th Sem.	7. Developing Sustainable Water management system for rural areas and implementation approaches. 8. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc., 9. Spreading public awareness under rural outreach programs. (minimum 5 programs). 10. Social connect and responsibilities.
6th Sem.	11. Plantation and adoption of plants. Know your plants. 12. Organize National integration and social harmony events / workshops / seminars. (Minimum 02programs). 13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

Pedagogy – Guidelines, it may differ depending on local resources available for the study aswell as environment and climatic differences, location and time of execution.

SN	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Organic farming, Indian Agriculture(Past, Present and Future) Connectivity for marketing.	May be individual orteam	Farmers Land / Villages / Roadside / Community Area / College Campus Etc.,	Site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Waste management– Public, Private and Govt. organization,5 R's.	May be individual orteam	Villages / City Areas /Grama Panchayat / Public Associations / Government SchemesOfficers / Campus Etc., ,	Site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

3.	Setting of the information imparting club forwomen leading to contribution in social and economic issues.	May be individual orteam	Women Empowerment Groups / Consulting NGOs & Govt. Teams / College CampusEtc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
4.	Water conservation techniques – Role of different stakeholders– Implementation.	May be individual orteam	Villages / City Areas /Grama Panchayat / Public Associations / Government SchemesOfficers / Campus Etc.,	site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
5.	Preparing an actionable businessproposal for enhancing the village income andapproach for implementation.	May be individual orteam	Villages / City Areas /Grama Panchayat / Public Associations / Government SchemesOfficers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
6.	Helping local schools to achieve good results and enhance their enrolment in Higher / technical /vocational education.	May be individual orteam	Local Government / Private / Aided Schools / Government Schemes Officers / Etc.,	School selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
7.	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual orteam	Villages / City Areas /Grama Panchayat / Public Associations / Government SchemesOfficers / Campus Etc.,	site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
8.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.,	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

9.	Spreading public awareness under rural outreach programs (minimum5 programs) / Social connect and responsibilities.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
10.	Plantation and adoption of plants. Know your plants.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
11.	Organize National integration and social harmony events / workshops / seminars. (Minimum 02 programs).	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
12.	Govt. school Rejuvenation and helping them to achieve good infrastructure.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government/ Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for Each Semester)

SN	Practice Session Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

- In every semester from 3rd semester to 6th semester, Each student should do activities according to the schemeand syllabus.
- At the end of every semester student performance has to be evaluated by the NSS officer for the assigned activityprogress and its completion.
- At last in 6th semester consolidated report of all activities from 3rd to 6th semester, compiled report should be
- submitted as per the instructions.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Understand the importance of his / her responsibilities towards society.

CO2: Analyze the environmental and societal problems / issues and will be able to design solutions for the same

CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development.

CO4: Implement government or self-driven projects effectively in the field.

CO5: Develop capacity to meet emergencies and natural disasters & practice national integration and socialharmony in general.

SUGGESTED LEARNING RESOURCES:

Books:

- **NSS Course Manual,** Published by NSS Cell, VTU Belagavi.
- Government of Karnataka, NSS cell, activities reports and its manual.
- Government of India, NSS cell, Activities reports and its manual.

Semester: III

Additional Mathematics- I

Course Name: **Applied Mathematics (Diploma Students)**

Course Code	23MATDIP31	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	0
Total Hours of Pedagogy	40	Total Marks	50
Credits	0	Exam Hours	0

Pre-requisites:

1. Algebraic formulae, Differentiation
2. Integration
3. Trigonometric formulae

Module – 1: Linear Algebra

Introduction-Rank of matrix by elementary row operations- Row-Echelon form. Consistency of system of linear equations, Solution of linear equations-Gauss Siedal method, Gauss Jordan method Gauss elimination method. Finding largest Eigen value and corresponding Eigen vector using Rayleigh power method. Problems

Self-Study: Eigen values and Eigen vectors **08 Hours**

Module – 2: Differential Calculus

Review of successive differentiation-Illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobeans of order two-problems.

Self-Study: Taylor's series expansion **08 Hours**

Module – 3: Numerical Methods

Solution of algebraic and transcendental equations by Newton-Raphson method and Secant method. Interpolation: Newton's Forward and Backward Interpolation formulae, Newton's divided difference formula, Lagrange's Interpolation formula without proof problems. Numerical Integration: Simpson's 1/3nd and 3/8th rule (without proof) - problems.

Self-Study: Regula- Falsi method , Weddle's rule **08 hours**

Module – 4: Integral Calculus

Review of elementary integral calculus. Reduction formulae for Sin^nx, Cos^nx(with proof) and $Sin^mx.Cos^mx$ (without proof) and evaluation of these with standard limits- Examples. Double and triple integrals-Simple problems. **Self-Study:** Change of order of Integration **08 Hours**

Module – 5: Ordinary Differential Equations

Introduction-Solutions of first order and first degree ordinary differential equation, Linear differential equations: Bernoulli's equation, exact differential equations. **Self-Study:** Homogeneous Differential Equations **08 Hours**

Course outcomes:

Upon Completion of this course, student will be able to,

1. Make use of matrix theory for solving system of linear equations and compute Eigen values and Eigen vectors.
2. Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors
3. Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.
4. Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and the volumes.
5. Solve first order linear differential equations analytically using standard methods.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S.Grewal	Khanna Publications	2021
2	Advanced Engineering Mathematics	E.Kreyszig	John Wiley and sons	2018

3	Additional Mathematics-1	Dr. K. S. C	Sudha Publications	Volume-I
4	Additional Mathematics-I	Pandurangappa. C	Interline Publications	Volume-I
Reference Books				
1	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw Hill	2010
2	Transform Calculus, Fourier Series & Numerical Techniques	Dr. K.S.C	Sudha Publications	2019

e-resources:

https://youtube.com/playlist?list=PLpklqhIbn1jprs89osdFFmhA7mQ-7xC86&si=1ykFJs8yn2siD44l

https://youtube.com/playlist?list=PLKS7ZMKnbPrQukeSraYiel-cNtwscFtlQ&si=0kOh38EUmGYPtcoW

https://youtube.com/playlist?list=PLEHGYFbPuuMGfyIXGx8V-Xhi0HRSjT8Ak&si=TjaIVlRWo4G5DDAe

https://youtube.com/playlist?list=PLNKD1qB9ppttx4WuHV0TWRy5dWuVSKEtT&si=7ZCCeKFZguHm0Zrk

Scheme of Teaching and Evaluation for

B.Tech– IV Semester

Computer Science & Engg.

(2023 Scheme)

Semester-IV
Course Name: BIOLOGY FOR ENGINEERS

Course Code	**23BB41**	CIE Marks	**50**
Teaching Hours / Week (L:T:P: S)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**3**
Examination type (SEE)	**Theory**		

Course objectives:

- To familiarize the students with the basic biological concepts and their engineering applications.
- To enable the students with an understanding of bio design principles to create novel devices and structures.
- To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
- To motivate the students to develop interdisciplinary vision of biological engineering.

Teaching-Learning Process (General Instructions)

These are sample Strategies which teachers can use to accelerate the attainment of the various course outcomes.

1. Explanation via real life problem, situation modelling, and deliberation of solutions, hands-on sessions, reflective and questioning / inquiry-based teaching.
2. Instructions with interactions in classroom lectures (physical / hybrid).
3. Use of ICT tools, including YouTube videos, related MOOCs, AR / VR / MR tools.
4. Flipped classroom sessions (~10% of the classes).
5. Industrial visits, Guests talks and competitions for learning beyond the syllabus.
6. Students' participation through audio-video based content creation for the syllabus (as assignments).
7. Use of gamification tools (in both physical / hybrid classes) for creative learning outcomes.
8. Students' seminars (in solo or group) / oral presentations.

Module-1	**8 hours**
INTRODUCTION TO BIOLOGY: The cell: the basic unit of life, Structure and function of a cell. The plan cell and animal cell Prokaryotic and Eukaryotic cell. Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nuclei acids, Proteins, lipids. Importance of special Biomolecules. Enzymes (Classification (With one example each), properties and functions), vitamins and hormones.	
Module-2	**8 hours**
BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).	
Module-3	**8 hours**
HUMAN ORGAN SYSTEMS AND BIO DESIGNS (QUALITATIVE): Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye).Heart as	

a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine).Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).
Module-4 **8 hours**
NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (QUALITATIVE): Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Sharkskin (Friction reducing swimsuits), Kingfisher beak (Bullet train). Human Blood substitutes - haemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).
Module-5 **8 hours**
TRENDS IN BIOENGINEERING (QUALITATIVE): Bio printing techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bio imaging and Artificial Intelligence for disease diagnosis. Self-healing Bio concrete (based on bacillus spores, calcium lactate nutrients and bio mineralization processes), Bioremediation, and Bio mining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Elucidate the basic biological concepts via relevant industrial applications and case studies.
2. Evaluate the principles of design and development, for exploring novel bioengineering projects.
3. Corroborate the concepts of biomimetic for specific requirements.
4. Think critically towards exploring innovative bio based solutions for socially relevant problems.

Suggested Learning Resources:

Books

- Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetic: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019.
- 3D Bio printing: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Web links and Video Lectures (e-Resources):

https:// nptel.ac.in/courses/121106008

https:// freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
https:// ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
https:// ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
https:// www.coursera.org/courses?query=biology
https:// onlinecourses.nptel.ac.in/noc19_ge31/preview
https:// www.classcentral.com/subject/biology
https:// www.futurelearn.com/courses/biology-basic-concepts

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Group Discussion of Case studies
- Model Making and seminar / poster presentations
- Design of novel device / equipment like Cellulose-based water filters, Filtration system

Semester: IV
Course Name: MICROCONTROLLER AND EMBEDDED SYSTEMS

Course Code:	**23CS42**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**40 + 20**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Pre-requisites:

- Basics of embedded system and Microcontroller.
- Types of Processor.
- Basics of assembly language.

Course objectives:

1. Explain the fundamentals of ARM based systems.
2. Utilize instruction set of ARM controller with examples.
3. Identify various embedded system components, their purpose and applications.
4. Demonstrate the use of Embedded System design concepts with examples.
5. Outline the real time operating system concepts used in the embedded system.

Module-1	**8 Hours**
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions	
Module-2	**8 Hours**
Introduction to the ARM Instruction Set : Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants	
Module-3	**8 Hours**
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.	
Module-4	**8 Hours**
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes ,non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling,	
Module-5	**8 Hours**
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task	

Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging,

PRACTICAL COMPONENT 20 Hours

SN	List of Experiments
1	Write a program to add, subtract and multiply two 16-bit binary numbers.
2	Write a program to find the sum of first 10 integer numbers
3	Write a program to find Fibonacci series up to a given number
4	Write a program to add an array of 16-bit numbers and store the 32-bit result in internal RAM
5	Write a program to find the square of a number (1 to 10) using look-up table.
6	Interface and Control a DC Motor.
7	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction
8	Interface and control a Buzzer ON and OFF
9	Demonstrate the use of an external interrupt to toggle an LED On/Off.
10	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

Course Outcomes:

1. Utilize the fundamentals of ARM based systems.
2. Develop ARM based assembly language programs.
3. Interpret the components of embedded systems.
4. Demonstrate effectively Embedded System design concepts with examples.
5. Realize the real time operating system concepts used in the embedded system.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	ARM system developers guide,	Andrew N Sloss, Dominic Symes and Chris Wright	Elsevier, Morgan Kaufman publishers	2008.
2	Introduction to Embedded Systems	Shibu K V	Tata McGraw Hill Education, Private Limited	2nd Edition
Reference Books				
1	Embedded System	Raj Kamal,	Tata McGraw-Hill Publishers	2nd Edition, 2008
2	ARM System-on-Chip Architecture	Steve Furber	Pearson,	Second Edition, 2015

e-Resources:

https://www.youtube.com/watch?v=4VRtujwa_b8 (ARM-1)

https://www.youtube.com/watch?v=VcQl
0UPC7S0 (ARM-2)
https://www.youtube.com/playlist?list=PLbRMhDVUMngcJu5oUhgpgYqtOn7DmSfuU
(Embedded system design with ARM)
https://www.youtube.com/playlist?list=PLKbSRxrdxkT3sRzWE465KoxOH00BFbRs6
(Embedded C programming tutorial)
https://www.youtube.com/playlist?list=PLbRMhDVUMngcJu5oUhgpgYqtOn7DmSfuU
(Embedded system design with ARM)

Semester: IV
Course Name: DATABASE MANAGEMENT SYSTEMS

Course Code	**23CS43**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**40 + 20**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Pre-requisites:

- Knowledge of programming
- Data structures

Course objectives:

1. Learn and practice data modeling using entity relationship and developing database design
2. Practice SQL programming through a variety of database problems.
3. Apply normalization techniques to normalize the database
4. Demonstrate the use of concurrency and transactions in database
5. Design and build database applications for real world problems.

Module-1	**8 Hours**
Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. Centralized Client/Server architectures for DBMSs, Classification f Database Management Systems Oracle and MySql Database architecture.	
Module-2	**8 Hours**
Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Naming conventions and design Issues. Example of other notation Class diagrams Mapping conceptual design into a Logical design: Relational database design ER to Relational Mapping. **Relational Model:** Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.	
Module-3	**8 Hours**
SQL: Overview of SQL Query language, SQL Data definition, Basic Structure f SQL Queries, Additional Basic Operations, Set operations, Null values, Aggregate functions, Nested Sub queries, Modification of the database. NoSql and difference between SQL and NoSQL. **Advanced Queries:** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Advanced Aggregation Features: Ranking, dense rank, partition by.	
Module-4	**8 Hours**
SQL Programming techniques: Overview of database programming Techniques and Issues, Embedded SQL, Dynamic SQL, and SQLJ,JDBC: SQL Class Library for java programming, Database Stored Procedures.	

Normalization:
Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Examples on Normal forms.

Module-5 **8 Hours**

Transaction Processing:
Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.

Concurrency Control in Databases:
Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multisession Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking.

PRACTICAL COMPONENT 20 Hours

List of Experiments

1. Draw an E-R diagram and map it to relation table for a given scenario.
   (Order Database, Cricket Database, Movie Database, College Database, Voter Database, etc)
2. Normalize the tables.
3. Perform the following:
   Viewing all databases, creating a Database, viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)
4. Perform the following:
   Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
5. For a given set of relation schemes, create tables and perform the following
   i. Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions, Math Functions
   ii. Join Queries- Inner Join, Outer Join
   iii. Subqueries- With IN clause, With EXISTS and NOT EXISTS clause
6. For a given set of relation tables perform the following
   Creating Views (with and without check option), Dropping views, Selecting from a view
7. Demonstrate the core concepts on table like procedure and trigger queries and also rank() function.

Reference:
https://www.youtube.com/watch?v=AA-KL1jbMeY
https://www.youtube.com/watch?v=7S_tz1z_5bA
https://www.youtube.com/watch?v=lBpSMeQjNqQ
https://www.youtube.com/watch?v=_yog7h4BokQ
https://www.youtube.com/watch?v=hSiCUNVKJAo
https://www.youtube.com/watch?v=IqQhPlJP64k
https://www.youtube.com/watch?v=horURQewW9c https://www.youtube.com/watch?v=P7-wKbKrAhk https://www.youtube.com/watch?v=MSbzErdcb6g
https://www.youtube.com/watch?v=QFj-hZi8MKk

Course Outcomes:

1. Demonstrate the basic elements of a relational database management system.
2. Design ER and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
3. Create, populate and manage relational databases in SQL.
4. Extend normalization for the development of application software.
5. Analyze and implement transaction processing, concurrency control, and database recovery protocols in database.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson	7th Edition, 2017
2	Database System Concepts	Abraham Silberschatz, Henry F. Korth and S. Sudarshan	Tata Mcgraw Hill Education Private Limited	6th Edition
Reference Books				
1	Database management systems	Ramakrishnan, and Gehrke	McGraw Hill	3rd Edition, 2014
2	An Introduction to Database Systems	Christopher J. Date, S. Swamynathan and A. Kannan	Pearson Education	8th Edition

E-Resources: https://www.youtube.com/watch?v=wOD02sezmX8
https://www.youtube.com/watch?v=hlGoQC332VM
https://www.youtube.com/watch?v=NNpFHQl_GT0
https://www.youtube.com/watch?v=EGEwkad_llA
https://www.youtube.com/watch?v=t5hsV9lC1rU

Semester: IV

Course Name: ANALYSIS AND DESIGN OF ALGORITHMS

Course Code	**23CS44**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**3**	Exam Hours	**03**

Course Objectives

1. Describe basic concepts, notations, methods used in design and analysis of algorithms
2. Explain various algorithm design techniques.
3. Design and analyze the efficiency of a given problem using various design techniques.
4. Differentiate efficiency of different algorithm design techniques for a given problem.
5. Apply the suitable algorithm design technique for a given problem.

Module -1	**8 Hours**
Introduction: Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive Algorithm, Mathematical Analysis of Recursive Algorithms.	
Module -2	**8 Hours**
Brute Force and Exhaustive Search: Selection Sort and Bubble Sort, Exhaustive Search. **Decrease-and-Conquer:** Insertion Sort, Topological Sorting, Algorithms for Generating Combinatorial Objects,Decrease by- a-Constant-Factor Algorithms: Binary Search, Variable-Size-Decrease Algorithm: Euclid's Algorithm	
Module -3	**8 Hours**
Divide-and-Conquer: Recurrence equation for divide and conquer, Master Theorem, Finding the maximum andminimum, Merge sort, Quicksort, Binary Search, Strassen's Matrix Multiplication. **Transform-and-Conquer:** Presorting, Heaps and Heapsort, Problem Reduction Computing the Least CommonMultiple.	
Module -4	**8 Hours**
Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm **Dynamic Programming:** The Knapsack Problem, Warshall's and Floyd's Algorithms. Bellman-Ford Algorithm,Travelling Sales Person problem.	
Module -5	**8 Hours**
Backtracking: *n*-Queens Problem, Subset-Sum Problem, Graph coloring, Hamiltonian cycles. **Branch-and-Bound:** Knapsack Problem, Traveling Salesman Problem, Job Assignment Problem. **NP-Complete and NP-Hard problems:** Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, andNP-Hard classes.	

Course Outcomes:

1. Apply the basic knowledge of mathematical fundamentals for finding time complexity of recursive and non-recursive algorithms.
2. Describe various algorithm design techniques to solve a given problem.
3. Apply various design techniques to find the time complexity of a given problem
4. Compare efficiency of different algorithm design techniques for a given problem
5. Choose the appropriate algorithm design techniques for a given problem.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Introduction to the Designand Analysis of Algorithms	Anany Levitin	Pearson	2nd Edition, 2009
2	Computer Algorithms/C++	Ellis Horowitz, Satraj Sahni and Rajasekaran	Universities Press	2nd Edition, 2014
Reference Books				
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, CliffordStein	PHI	3rd Edition, 2009
2	Design and Analysis of Algorithms	S. Sridhar	Oxford, Higher Education	2014

Semester: IV

Course Name: ALGORITHMS LAB

Course Code	**23CSL45**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**20**	Total Marks	**100**
Credits	**01**	Exam Hours	**03**

Course Objectives:

1. Demonstrate the basics concepts of Java Programming.
2. Illustrate Different Sorting Algorithm design techniques.
3. Solve Graph Applications using various design techniques.
4. Interpret combinatorial problems using Backtracking technique.
5. Develop skills to identify suitable algorithm design technique to solve a given problem

List of Experiments:

Identify the functional requirements, then Design and Develop solutions to the problems related to thefollowing Algorithm design techniques

1. Brute Force technique
2. Decrease-and-Conquer method
3. Divide-and-Conquer technique
4. Transform-and-Conquer technique
5. Greedy Method
6. Dynamic Programming
7. Backtracking

Course outcomes:

1. Design programs to implement basic concepts of java programs.
2. Apply various algorithm design techniques to solve sorting problems.
3. Implement graph Applications using various design techniques.
4. Execute programs on combinatorial problems using Backtracking technique.
5. Choose appropriate design technique to solve a given problem.

Semester: IV

Course Name: SYSTEM SOFTWARE

Course Code	**23CS461**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:

1. Basic Computer organization and architecture
2. Basic concepts of Operating System
3. Good programming skills in C and data structures

Course objectives:

1. Distinguish between system software and application software
2. Categorize the instruction formats and addressing modes of SIC and SIC/XE machine.
3. Write the object code for SIC and SIC/XE machine programs
4. List the steps involved to design a Bootstrap loader
5. Apply regular expressions to develop programs using LEX and YACC tools.

Module-1	**8 Hours**
Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples. **Assemblers -1:** Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures,Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.	
Module-2	**8 Hours**
Assemblers -2: Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression,Program Blocks, Control Sections and Programming Linking, Assembler Design Operations – 1 Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.	
Module-3	**8 Hours**
Loaders and Linkers: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a LinkingLoader; Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker.	
Module-4	**8 Hours**
Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.	
Module-5	**8 Hours**
Lex and Yacc - The Simplest Lex Program, Recognizing Words with LEX, Symbol Tables, Grammars, Parser- Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running 43 LEX and YACC, LEX and Hand- Written Lexers, Using LEX -	

Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line.
Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity, Variables and Typed Tokens.

Course outcomes:

- Design programs to implement basic concepts of java programs.
- Apply various algorithm design techniques to solve sorting problems.
- Implement graph Applications using various design techniques.
- Execute programs on combinatorial problems using Backtracking technique.
- Choose appropriate design technique to solve a given problem.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	System Software	Leland L.Beck D Manjula	Pearson Education	3rd Ed, 2012
2	Lex and Yacc	John R. Levine, Tony Mason and DougBrown	O'Reilly	2012
Reference Books				
1	System Programming and Operating Systems	D.M. Dhamdhere,	Tata McGraw - Hill	3rd Ed, 2013.
2	Systems programming	Srimanta Pal	Oxford university press	2016

Semester: IV

Course Name: OBJECT ORIENTED PROGRAMMING WITH PYTHON

Course Code	**23CS462**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**3**	Exam Hours	**3**

Pre-requisites:

- Basic Knowledge of Programming
- Basic Knowledge of MS word, Excel and PDF

Course objectives:

1. Learn the syntax and semantics of Python programming language.
2. Illustrate the process of structuring the data using lists, tuples and dictionaries.
3. Demonstrate the use of built-in functions of file system.
4. Implement the Object Oriented Programming concepts in Python.
5. Appraise the need for working with various documents like Excel, PDF, Word and Others.

Module-1	**8 Hours**
Python Basics, Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, **Flow control,** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), **Functions,** def Statements with Parameters, Return Values andreturn Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number	
Module-2	**8 Hours**
Lists, The List Data Type, working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References, **Dictionaries and Structuring Data,** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, **Manipulating Strings,** Working with Strings, Useful String Methods	
Module-3	**8 Hours**
Reading and Writing Files, Files and File Paths, The os path Module, The File Reading/Writing Process, SavingVariables with the shelve Module, Saving Variables with the pprint. pformat() Function, Project: Generating Random Quiz Files, Project: Multi clipboard, **Organizing Files,** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European- Style Dates, Project: Backing Up a Folder into a ZIP File, **Debugging,** Raising Exceptions, Getting the Tracebackas a String, Assertions, Logging, IDLE‟s Debugger.	
Module-4	**8 Hours**
Classes and objects, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, **Classes and functions,** Time, Pure functions, Modifiers, Prototyping versus planning, **Classesand methods,** Object-oriented features, Printing objects, Another example,	

A more complicated example, The init method, The str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation, **Inheritance,** Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation
Module-5 **8 Hours**
Working with Excel Spreadsheets, Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts, **Working with PDF and Word Documents,** PDF Documents, Project: Combining Select Pages from Many PDFs,Word Documents, **Working with CSV files and JSON data, The csv Module**

Course Outcomes:

1. Demonstrate proficiency in handling of loops and creation of functions.
2. Identify the methods to create and manipulate lists, tuples and dictionaries.
3. Utilize built-in functions to navigate the file system.
4. Apply the concepts of Object-Oriented Programming to different applications
5. Develop proficiency in working with Excel spreadsheets, PDF and Word documents, CSV files, and JSON data

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Automate the Boring Stuff with Python	Al Sweigart	No Starch Press,	1st Edition, 2015
2	Think Python: How to Think Like aComputer Scientist",	Allen B. Downey	Green Tea Press	2nd Edition, 2015.
Reference Books				
1	Introduction to Python Programming	Gowrishankar S,Veena A	CRC Press /Taylor &Francis	1st Edition, 2018

e-Resources:

https://automatetheboringstuff.com
http://greenteapress.com/thinkpython2/thinkpython2.pdf)

Semester: IV

Course Name: INTRODUCTION TO DATA ANALYTICS

Course Code	**23CS463**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:

- Basic Knowledge of DBMS
- Basic Knowledge of Microsoft Excel

Course objectives:

1. To learn various concepts and technologies of Data Analytics
2. To discuss the various OLTP system characteristics
3. To discuss the various aspects related to the Data lake and Data warehouse
4. To present the data using various Visualization tools

Module-1	**8 Hours**
Introduction, Business Intelligence, Pattern Recognition, Data Processing Chain. Business Intelligence Concepts and Applications: Introduction, BI for better decisions, decision types, BI tools,BI skills, BI applications.	
Module- 2	**8 Hours**
Structure, objectives, introduction, online transaction processing, OLTP system characteristics, OLTP merits anddemerits, need of data warehouse, characteristics of DW, main components of data warehouse, approaches for constructing a data warehouse, dimensional modeling used in DW design-facts, dimensions and attributes, types of schemas, ETI and other tools sets available in market.	
Module-3	**8 Hours**
Structure, objectives, business intelligence, BI characteristics, data quality: a real challenge, data quality best practices, structured versus unstructured, differences between structured and unstructured data, data lake, data lakeversus data warehouse, main components of a data lake, modern business intelligence system, benefits and use cases of modern BI.	
Module-4	**8 Hours**
Structure, objectives, presenting data visualization, aims of data visualization, history at a glance, importance of data visualization, types of data visualization-hierarchical, tree diagram, tree map, ring chart, dendogram, temporal, bar chart, line graph, stacked graph, Gantt chart, scatter plot, stacked area chart, Sparkline, network, word cloud, matrix chart, node link diagram, multi-dimensional, pie chart, histogram.	
Module-5	**8 Hours**
Introduction, decision tree problem, decision tree construction, decision tree algorithms. Advanced data visualization- structure, objective, types of advanced data visualization-bubble chart, word cloud,geospatial heat map/ hot spot mapping, data visualization trends, introducing data visualization tools, data visualization best practices.	

Course Outcomes:

At the end of the course the student will be able to:

1. Apply the BI concepts to solve real life problems.
2. Design OLTP techniques to provide business solutions
3. Apply BI techniques to design a data lake.
4. Analyze data using various data visualization techniques.
5. Analyze trends using advanced data visualization techniques.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Data Analytics	Anil Maheshwari	McGraw Hill Education	2018
2	Data Analytics: Principles, Tools, and Practices	Dr.Gaurav Aroraa Chitra LeleDr.Munish Jindal	BPB Publications	1st Edition, 2022

Semester: IV

Course Name: PROFESSIONAL SKILLS FOR THE WORK PLACE

Course Code	**23PSW47**	CIE Marks	**50**
Teaching Hours / Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**30**	Total Marks	**100**
Credits	**01**	Exam Hours	**01**

Pre-requisites:

1. Basic Conversational English
2. Fundamentals of Mathematics
3. Basic Knowledge of Reasoning

Module -1	**6 Hours**
Communication Skills Basic Tools of Communication, Listening Skills, Body Language, Voice, Verbal Language, Conversations inProfessional Setting	
Module -2	**6 Hours**
Presentation Skills Zero Presentation, Individual Presentations, Feedback, Types of Introductions, Captivating the Audience, Interaction Methods, Signing off.	
Module -3	**6 Hours**
Verbal & Numerical Ability Vocabulary is Fun, Root Words, Sentence Structures, Bouncing, Similar and Opposite Words, Common Errors,Number System, Factors and Multiples.	
Module -4	**6 Hours**
English Language Phonetic and Non-phonetic Languages, sounds in English, IPA, Syllables, Word Stress, Stress patterns in Indianlanguages vs English, Pausing and Rhythm in English, Sentence Structures, Bouncing, Common Errors.	
Module -5	**6 Hours**
Verbal Ability and Verbal Reasoning Similar and Opposite words, Number and Alphabet Series, Human Relations, Direction Tests, Coding Decoding,Clocks and Calendars	

Course Outcomes:

1. Demonstrate communicative ability in a professional environment
2. Articulate one's ideas and demonstrate them to an audience
3. Transform one's English Vocabulary and Language Structure
4. Interpret international phonetic symbols, stress patterns, and enhance English speech

5. Identify patterns, determine the problem-solving process & validate solutions

Suggested Learning Resources:

SN	Title of the Book	Name of the Author / s	Name of the Publisher	Edition and Year
Textbooks				
1	Reasoning N' Reasoning - Verbal& Non-verbal Reasoning	Dr. Ravi Chopra	Galgotia	1994
2	Magical Book on Quicker Math	M. Tyra	BSC	I Edition, 2018
3	Communicate With Confidence	Diana Booher	Mc-Graw-Hill	Nov 2011
Reference Books				
1	Cambridge Advanced Learner's Dictionary	Cambridge University Press	CBS	IV Edition, 2013
2	A Modern Approach to Verbal and Non-verbal Reasoning	R S Agarwal	S Chand	II Edition, 2018
3	Word Power Made Easy	Norman Lewis	Goyal Publishers	IV Edition, 2014
4	Speak With Confidence	Diana Booher	Mc-Graw-Hill	I Edition, 2002

Semester: IV

Course Name: UNIVERSAL HUMAN VALUES (UHV)

Course Code	**23UH48**	CIE Marks	**50**
Teaching Hours / Week (L: T:P: S)	**1:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**15 hour Theory Session +15 hour Self study**	Total Marks	**100**
Credits	**01**	Exam Hours	**01 Hour**
Examination type (SEE)	SEE paper shall be set for 50 questions, each of the 01 mark. The patternof the question paper is MCQ (multiple choice questions).		

Course objectives:

This course is intended to:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustfuland mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4. This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic andrational study of the human being vis-à-vis the rest of existence.
2. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted sothat the activities will develop students' theoretical and applied skills.
3. State the need for UHV activities and its present relevance in the society and Provide real-life examples.
4. Support and guide the students for self-study activities.
5. You will also be responsible for assigning homework, grading assignments and quizzes, and documentingstudents' progress in real activities in the field.
6. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with,and then to continue within the student in every activity, leading to continuous self-evaluation.

Encourage the students for group work to improve their creative and analytical skills

Module -1	**3 Hours**
Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the BasicHuman Aspirations	

Module -2	3 Hours
Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of theSelf and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Selfwith the Body, Programme to ensure self-regulation and Health	
Module -3	**3 Hours**
Harmony in the Family and Society : Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to- Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	
Module -4	**3 Hours**
Harmony in the Nature / Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception ofHarmony in Existence	
Module -5	**3 Hours**
Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towardsValue-based Life and Profession	

Course Outcome (Course Skill Set)

At the end of the course, students are expected to become more aware of themselves, and their surroundings (family,society, nature);

- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Expected to positively impact common graduate attributes like:

- Ethical human conduct
- Socially responsible behavior
- Holistic vision of life
- Environmentally responsible work
- Having Competence and Capabilities for Maintaining Health and Hygiene

Appreciation and aspiration for excellence (merit) and gratitude for all

Suggested Learning Resources:

Books for READING:

Text Book and Teachers Manual

- The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1
- The Teacher's Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G

Reference Books:

- Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews

Semester: IV

Course Name: PHYSICAL EDUCATION (SPORTS & ATHLETICS) – II

Course Code	**23PE49**	CIE	**100 Marks**
Credits: L:T:P	**0:0:2**		
Total Hours	**30 P**		

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the ethics and moral values in sports and athletics
2. Perform in the selected sports or athletics of student's choice.
3. Understand the roles and responsibilities of organization and administration of sports and games.

Module IV: Ethics and Moral Values	**5 Hours**
Ethics in Sports Moral Values in Sports and Games	
Module V: Specific Games (Any one to be selected by the student)	**20 Hours**
Volleyball – Attack, Block, Service, Upper Hand Pass and Lower hand Pass.Throw ball – Service, Receive, Spin attack, Net Drop & Jump throw. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up. Table Tennis – Service (Fore Hand & Back Hand), Receive (Fore Hand & Back Hand), Smash.Athletics (Track / Field Events) – Any event as per availability of Ground.	

Assessment Details

1. Integrated professional Core Courses (IPCC):

CIE for the Theory component of IPCC: 30 Marks

	Components	Number	Weightage	Max. Marks
1	Tests (A)	3	60%	18
2	Alternate Assessment Tools(AAT) (B)	3	40%	12
X	Total Marks for theory component A+B			30

CIE for the LAB component of IPCC: 20 Marks

	Components	Weightage	Max. Marks
1	Lab Work: Conduction of Experiments (A)	40%	08
2	Lab Journal Writing & Submission (B)	10%	02
3	Lab Test (C)	30%	06
4	Open-Ended Experiments / Course Projects (D)	20%	04
	Total Marks		20

Final Marks for IPCC Courses = X + Y = 30 + 20 = 50

SEE for IPCC Theory for 3 hours' duration

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module. The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE componentonly. Questions mentioned in the SEE paper shall include questions from the practical component)
- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component ofthe IPCC shall be for CIE only. However, in SEE, the questions from the laboratory componentshall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in theSEE. Marks secured will be scaled down to 50.

2. Professional Core / Basic Science /ESC/ETC/PLC courses (Theory):

Continuous Internal Evaluation (CIE):

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools(AAT) (B)	3	40%	20
	Total Marks			**50**

Final CIE Marks = (A) + (B) = 30 + 20 = 50

Semester End Examination (SEE)

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module. Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in theSEE.
- Marks secured will be scaled down to 50.

3. Professional Core Course (PCC) Lab/Ability Enhancement course (Lab):Continuous Internal Evaluation (CIE):

	Components	Weightage	Max. Marks
(i)	Lab Work: Conduction of Experiments (A)	40%	20
(ii)	Lab Journal Writing & Submission (B)	10%	05
(iii)	Lab Test (C)	30%	15
(iv)	Open-Ended Experiments (D)	20%	10
	Total Marks: A+B+C+D		**50**

Semester End Evaluation (SEE):

1. All laboratory experiments are to be included for practical examination
2. Students can pick one experiment from the lot with equal choice to all the students in a batch.
3. Change of experiment is allowed only once and 15% marks allotted to the procedure part to be made zero.
4. Marks distribution: Procedure (15%) + Execution (70%) + Viva Voce (15%)

4. Ability Enhancement Course (AEC)/Skill Enhancement course (SEC) (Theory), Universal human valuesCourse (23UH48):

Assessment Details of CIE

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools (AAT) (B)	3	40%	20
	Total Marks			50

Final CIE Marks = (A) + (B) SEE Guidelines for the Courses

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximummarks meant for SEE.

Suggested Alternate Assessment Tools for PCC, IPCC and AEC Courses:

1. Quiz
2. Assignments
3. Seminars / Presentations
4. Paper Publications
5. Mini Projects
6. MOOCs
7. Industrial Visits and Report Writing
8. Self-learning with Certifications and
9. Cooperative and problem based learning.

No SEE for the courses: Social Connect and Responsibility (23SC37), NSS, YOGA, Sports and Athletics.

Semester: IV

Additional Mathematics- II

Course Name: **Applied Mathematics (Diploma Students)**

Course Code	23MATDIP41	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	0
Total Hours of Pedagogy	40	Total Marks	50
Credits	0	Exam Hours	0

Pre-requisites:

1. Algebraic formulae
2. Differentiation
3. Integration
4. Trigonometric formulae

Module – 1: Higher Order ODE's

Linear Differential equations of second and higher order equations with constant coefficients. Homogeneous/non- homogeneous equations. Inverse differential operators. Particular integral restricted to $\emptyset(x) = e^{ax}, sinax, cosax$, polynomial of x

Self-Study: Finding Particular Integral **08 Hours**

Module – 2: Laplace Transforms

Definition, Laplace transforms of elementary functions. Laplace transform of e^{at}f(t), t^nf(t) (without proof). Laplace transform of Periodic functions (statement only) and Unit-step function-problems.

Self-Study: Unit Impulse Function.

08 Hours

Module – 3: Inverse Laplace Transforms

Inverse Laplace Transform: Definition, Inverse Laplace Transform of standard functions. Inverse transform by Partial Fraction Method. Method of solving Differential Equations using Laplace Transform.

Self-Study: Convolution Theorem **08 Hours**

Module – 4: Numerical Methods

Numerical Solution of Ordinary Differential Equations (ODE's): Numerical solution of ordinary differential equations of first order and first degree- Taylor's series method, Modified Euler smethod,Runge-KuttamethodoffourthorderandMilne'spredictor- correctorformula(Noderivationsof formulae) Problems.

Self-Study: Adam-Bashforth Method **08 Hours**

Module – 5: Probability

Introduction, sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes' theorem. **Self-Study:** Applications of Bayes' theorem **08 Hours**

Course outcomes:

Upon completion of this course, student will be able to,

1. Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.
2. Use Laplace Transform in solving differential /integral equation arising in network analysis, control systems and other fields of engineering
3. Use inverse Laplace Transform in solving differential /integral equation arising in network analysis, control systems and other fields of engineering
4. Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena. .
5. Use the concepts of probability in different probability distribution

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S.Grewal	Khanna Publications	2021
2	Advanced Engineering Mathematics	E.Kreyszig	John Wiley and sons	2018
3	Additional Mathematics-II	Dr. K. S. C	Sudha Publications	Volume-II
4	Additional Mathematics-II	Pandurangappa. C	Interline Publications	Volume-II
Reference Books				
1	Higher Engineering Mathematics	B.V.Ramana	Tata Mcgraw Hill	2010
2	Transform Calculus, Fourier Series & Numerical Techniques	Dr. K.S.C	Sudha Publications	2019