Hyderabad Karnataka Education Society's

Poojya Doddappa Appa Engineering College, Kalaburagi (An Autonomous Institution)

Department of Computer Science & Engineering

SCHEME OF TEACHING FOR IV SEMESTER (CSE)–22 SERIES for Academic 2023-2024 (Approved)

Sl.No.	Course	Course Code	Course Title	Teaching Hours/Week				Examination				
				Theory Lecture(L)	Tutorial(T)	Practical	Self Study(S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1	PCC	22CS41	Microprocessors and Microcontrollers	3	0	0	0	3	50	50	100	3
2	IPCC	22CS42	Database Management Systems	3	0	2	0	3	50	50	100	4
3	IPCC	22CS43	Analysis and Design of Algorithms	3	0	2	0	3	50	50	100	4
4	PCCL	22CSL44	Microprocessors and Microcontrollers Lab	0	0	2	0	3	50	50	100	1
5	ESC	22CS45A	Finite Automata and Formal Languages	3	0	0	0	3	50	50	100	3
6	BSC	22BSC46	Biology for Engineers	3	0	0	0	3	50	50	100	3
7	UHV	22UHV47	Universal Human Values	0	2	0	0	2	50	50	100	1
8	AEC	22CSAE481	Web Application Development	0	0	2	0	3	50	50	100	1
9	NCMC	22NS49	National Service Scheme(NSS)	0	0	2	0	0	50	0	50	0
10		22PE49	Physical Education(PE)Sports &Athletics									
11		22YO49	Yoga									
			Total	**15**	**2**	**10**	**0**	**23**	**450**	**400**	**850**	**20**

BSC: Basic Science Course, **IPCC**: Integrated Professional Core Course, **PCC**: Professional Core Course, **ESC**: Engineering Science Course, **UHV**: Universal Human Values, **AEC** : Ability Enhancement Course, **NCMC**: Non-Credit Mandatory Course.

Course Title: MICROPROCESSORS AND MICROCONTROLLERS		
Subject Code : 22CS41	**Credits :03**	**CIE: 50**
Number of Lecture Hours/Week (L:T:P)	**3:0:0 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**42**	**SEE Hours: 03**

Prerequisites: Basic Electronics

Course objectives:

- Explore the microprocessor architecture and its instruction set.
- Develop skills for programming in Assembly language.
- Interface Peripheral devices with 8086 Microprocessor and ARM Processor

MODULES	**Teaching Hours**
Module - I **The 8086/8088 Processors :** Architecture of 8086 microprocessor, Signal Descriptions of 8086, Physical Memory Organization, Minimum and Maximum Mode 8086 System and Timings, The Processor 8088. **8086/8088 Instruction Set Assembler Directives :** Machine Language Instruction Formats, Addressing Modes of 8086, Instruction Set of 8086/8088, Assembler Directives and Operation.	**09 Hrs**
Module-II **Assembly Language Programming with 8086/8088:** A Few Machine Level Programs, Machine Coding the Programs, Programming with an Assembler, Assembly Language Example Programs. **Special Architectural Features and Related Programming:** Introduction to stack, stack structure of 8086/88, interrupts and interrupt service routines, Interrupt cycle of 8086/88, Non maskable interrupt, Maskable interrupt, Interrupt programming.	**08 Hrs**
Module-III **Special Architectural Features and Related Programming Cont..:** passing parameter to procedures, MACROs, Timings and Delays. **Basic Peripherals and their Interfacing with 8086/88:** Semiconductor Memory interfacing, Dynamic RAM interfacing, Interfacing I/O ports, P/O 8255, Modes of operations of 8255. Interfacing Analog to digital Converter, Interfacing Digital to Analog Converter.	**08 Hrs**
Module-IV **Microcontrollers**-Types of Microcontrollers-Criteria for selecting a microcontroller-Example Applications. Characteristics and Resources of a microcontroller. Organization and design of these resources in a typical microcontroller-8051.8051Architecture,signal description of 8051,register set of 8051,psw of 8051,memory and I/O addressing by 8051,interrupts and stack of 8051,8051 instruction set	**08 Hrs**
Module-V **ARM Processor Fundamentals**: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions. **ARM Instruction Set:** Data Processing Instructions, Branch Instructions, Software	

Interrupt Instructions, Program Status Register Instructions, Co processor Instructions, Loading Constants, Simple programming exercises. **Thumb instruction set:** Thumb Register usage, ARM-Thumb interworking, other branch instructions, Data Processing instructions, single-Register Load-Store instructions, Multiple-Register Load-Store instructions, stack instructions, software interrupt instruction.	**09 Hrs**

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text Books:

1. Bhurchandi and Ray, Advanced Microprocessors and Peripherals, Third Edition McGraw Hill, 2012
2. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, Pearson Education, 2011.
3. ARM System Developer's Guide, Andrew N.Sloss, Dominic Symes, Chris Wright, Elsevier 2014

Reference Books:

1. Barry B. Brey, The Intel Microprocessors – Architecture, Programming and Interfacing, Eighth Edition, Pearson Education, 2015
2. A. Nagoor Kani, Microprocessors and Microcontrollers, Second Edition, Tata McGraw Hill, 2012

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CS41	**CO1**	Describe internal architecture of 8086/8088 microprocessors and demonstrate instruction set and assembler directives.
	CO2	Demonstrate assembly language proficiency using various addressing modes, data transfer instructions and stack.
	CO3	Design hardware interfacing using the microprocessor.
	CO4	Describe internal architecture, register organization of 8051 microcontroller
	CO5	Describe ARM processor and demonstrate instruction set program.

Course Title: DATABASE MANAGEMENT SYSTEM DESIGN		
Subject Code : 22CS42	**Credit :4**	**CIE: 50**
Number of Lecture Hours/Week (L:T:P)	**3:0:2 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**42**	**SEE Hours: 03**
Prerequisites: knowledge of C, C++ Programming Principles, Data Structures		
Course Objectives: • Learn and practice data modeling using entity relationship and developing database design • Understand the use of SQL • Understand the functional dependency and Normalization Techniques. • Understand the online transaction processing and recovery methods.		

MODULES	**Teaching Hours**
Module I **Introduction:** An example, Characteristics of Database approach, Actors on the screen, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces. Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types.	**09 Hrs**
Module II Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two, Subclasses, Super Classes and Inheritance, Specialization and Generalization **Relational Model:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. The Relational Algebra and relational calculus	**08 hours**
Module III SQL: Schema Definition, Constraints, Queries, and Views, SQL Programming Techniques. **Database Design** - 1: Informal Design Guidelines for Relation Schemas, Functional Dependencies, And Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Code Normal Form.	**08 hours**
Module IV Database Design – 2: Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms **Transaction Processing Concepts:** 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 Techniques: Two- Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques, Validation Concurrency Control Techniques,	**09 hours**

Module V	
Transaction Processing contd.. Granularity of Data items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes. **Database Recovery Techniques :** Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm Recovery in Multi database Systems, Database Backup and Recovery from Catastrophic Failures. Database Security and Authorization: Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges.	**08 hours**

LIST OF EXPERIMENTS:

1. Implementation of DDL commands of SQL with suitable examples.
   - Create table
   - Alter table
   - Drop Table
2. Implementation of DML commands of SQL with suitable examples
   - Insert
   - Update
   - Delete
3. Implementation of different types of function with suitable examples
   - Number function
   - Aggregate Function
   - Character Function
   - Conversion Function
   - Date Function
4. Implementation of different types of operators in SQL
   - Arithmetic Operators
   - Logical Operators
   - Comparison Operator
   - Special Operator
   - Set Operation
5. Implementation of different types of Joins
   - Inner Join
   - Outer Join
   - Natural Join etc..
6. Study and Implementation of
   - Group By & having clause
   - Order by clause
   - Indexing
7. Study & Implementation of
   - Sub queries
   - Views
8. Study & Implementation of different types of constraints.
9. Study & Implementation of Database Backup & Recovery commands, Rollback, Commit, Savepoint.

10. Creating Database /Table Space, Managing Users: Create User, Delete User, Managing roles:- Grant, Revoke
11. Study & Implementation of PL/SQL.
12. Study & Implementation of SQL Triggers.

Mini project (Application Development using: Front end: VB/VC ++/JAVA or Equivalent Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent).

1. Inventory Control System.
2. Core Banking system
3. Hospital Management System.
4. Railway Reservation System.
5. Personal Information System.
6. Web Based User Identification System.
7. Timetable Management System.
8. Hotel Management System.
9. Library management
10. Electricity bill.
11. Hostel management.
12. Air reservation
13. Company management system.
14. Student information system.
15. University database system.

Guidelines for implementation of mini project

1. Draw ER Diagram.
2. Convert ER diagram to table/schema.
3. Apply normalization.
4. Design and implementation.
5. Generate report.

Note: Mini Projects will be considered for CIE and SEE

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text books:

1. Fundamentals of Database Systems - Elmasri and Navathe, 7th Edition,Addison- Wesley, 2016.
2. SQL – The Complete Reference- James R Groff, Paul N.Weinberg and Andrew J.Oppel, 3rd Edition, Mc-Graw Hill, 2009. (Module-II)

Reference Books:

1. Data Base System Concepts- Silberschatz, Korth and Sudharshan, 5th Edition, Mc-Graw Hill, 2006.
2. Database Management Systems -Raghu Ramakrishn anand Johannes Gehrke – 3rd Edition. MCSraw- Hill, 2003.
3. An Introduction to Database Systems - C.J. Date, A. Kannan, S. Swamynatham, 8th Edition, Pearson Education, 2006.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CS42	CO1	Understand the fundamentals and applications of data base management system.
	CO2	Implement and Interact database with SQL statements.
	CO3	Design data base by applying ER diagram, relational model, functional dependency and Normalization Techniques
	CO4	Illustrate and understand the basic issues of transaction processing and concurrency control.
	CO5	Demonstrate different recovery techniques and security issues

Course Title: ANALYSIS AND DESIGN OF ALGORITHMS		
Subject Code : 22CS43	**Credits :04**	**CIE: 50**
Number of Lecture Hours/Week (L:T:P)	**3:0:2 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**42**	**SEE Hours: 03**

Prerequisites: Data structures, C Programming

Course objectives:

- Analyze the asymptotic performance of the algorithms in time and space domain.
- Introduce various algorithm design techniques.

MODULES	**Teaching Hours**
Module-I **Introduction:** Algorithm, Fundamentals of Algorithmic Problem Solving, Important problem Types, Fundamental Data Structures, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical analysis of Non-recursive and Recursive Algorithms, Examples- Fibonacci Numbers	**09 Hrs**
Module- II **Brute Force:** Introduction, Selection sort, Bubble Sort, Sequential search and Brute-Force String Matching, Exhaustive Search, Depth first search and Breadth First search. **Decrease & Conquer** : Introduction, Insertion Sort, Topological Sorting, Algorithms for Generating Combinatorial objects.	**08 Hrs**
Module-III **Divide & Conquer :** Introduction, Merge Sort, Quick Sort, Binary search, Binary tree traversals & related properties, Multiplication of large integers & Stressen's Matrix Multiplication. **Transform & Conquer :** Introduction , Presorting, Balanced Search Trees, 2-3 Trees, Heaps and Heap Sort, Problem Reduction, **Space & Time Tradeoffs :** Sorting by Counting, Input Enhancement in String matching , Hashing.	**09 Hrs**
Module-IV **Dynamic Programming:** Introduction, Three basic examples, The Knapsack Problem and Memory Functions, Optimal binary search trees, Warshall's and Floyd's Algorithm. **Greedy Techniques**: Introduction, Minimum Spanning Tree, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman trees and codes .	**08 Hrs**
Module- V **Limitations of Algorithms Power:** Introduction, Lower- Bound Arguments, Decision Trees, P, NP, and NP – Complete Problems. **Coping with the limitations of Algorithm Power:** Backtracking, N-Queen‟s problem, Hamiltonian circuit problem, Subset problem, General remarks. **Branch and Bound :** The assignment problem , Knapsack problem, Travelling sales man problem.	**08 Hrs**

List of Programs Using C / C++

1. Write a C Program to find GCD using Euclid's, Middle School procedure, Prime Factorization algorithm
2. Write a C Program to Sort a given set of elements using Selection sort anddetermine the time required to sort elements.
3. Write a C Program to Check whether a given graph is connected or not usingDFS method.
4. Write a C Program to Print all the nodes reachable from a given starting node ina digraph using BFS method.
5. Write a C Program to sort a given set of elements using Merge sort method anddetermine the time required to sort the elements.
6. Write a C Program to Sort a given set of elements using Quick sort method anddetermine the time required to sort the elements.
7. Write a C Program to implement Recursive Binary search and linear search anddetermine the time required to search an element.
8. Write a C Program to Sort a given set of elements using Insertion sort anddetermine the time required to sort elements.
9. Write a C Program to Sort a given set of elements using the Heap sort methodand determine the time required to sort the elements.
10. Write a C Program to Implement Horspool algorithm for String Matching.
11. Write a C Program to implement 0/1 Knapsack problem using dynamic programming problem.
12. Write a C Program to Implement Floyd's algorithm for the All-Pairs Shortest-paths.
13. Write a C Program to Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
14. Write a C Program to Implement N Queen's problem using Back Tracking.

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text books:

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithm ", 3rd Edition, Pearson Edition, 2017.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction Algorithm", 4th Edition, PHI, 2022.
2. Horowitz E, Sahni S., Rajasekaran S., "Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CS43	CO1	Explain fundamental ideas used for designing and analyzing Algorithms.
	CO2	Demonstrate Brute Force, Decrease & Conquer techniques and analyze the performance of algorithms.
	CO3	Demonstrate design of Divide-and-Conquer ,Transform & Conquer algorithms and their efficiencies.
	CO4	Apply Dynamic Programming and Greedy Techniques to solve various graph problems efficiently.
	CO5	Describe Limitations of algorithms power and illustrate Backtracking, Branch-and-Bound algorithms to solve recursive and computational problems.

Course Title: MICROPROCESSORS AND MICROCONTROLLERS LAB		
Subject Code : 22CSL44	**Credits :01**	**CIE: 50**
Number of Practical Hours/Week/batch (L:T:P)	**0:0:2 Hrs**	**SEE: 50**
		SEE Hours: 03

Prerequisite: C Programming

Course Objectives:

1. Explore the Microprocessor and Micro controller Architecture
2. Explore Instruction set to develop assembly language program
3. Demonstrate peripheral device interface

List of Programs

1. Design an ALP to perform basic arithmetic operation.
2. Design an ALP to separate even and odd numbers from an array.
3. Design an ALP to find Factorial of a given 8-bit number.
4. Design an ALP to generate first 'n' Fibonacci series.
5. Design an ALP to count the number of 0's and 1's in a given number.
6. Design an ALP to create a file and delete an existing file.
7. Design an ALP to display the list of alphabets on the screen.
8. Design and develop an assembly language program to search a key element "X" in a list of "n" 16-bit numbers. Adopt linear search algorithm in your program for searching.
9. Design and develop an assembly program to sort a given set of "n" 16- bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.
10. Develop an assembly language program to compute nCr using recursive procedure. Assume that "n" and "r" are non-negative integers.
11. Design and develop an assembly program to interface 4*4 matrix keyboard. Using ARM TTDMI / LPC2148.
12. Design and develop an assembly program to implement the buzzer using ARM TTDMI / LPC2148
13. Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter- clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student) using ARM TTDMI/LPC2148.
14. Design and develop an assembly language program to
    - Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).
    - Generate a Half Rectified Sine wave form using the DAC interface.) Using ARMTTDMI/LPC2148.
15. To interface LCD with ARM processor ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD

Course Code	CO #	Course Outcome (CO)
22CSL44	CO1	Develop ALP to implement arithmetic operations using 8086 microprocessor.
	CO2	Design and develop assembly programs using 8086 DOS functions, subroutines and macros in assembly language
	CO3	Develop ALP for searching and sorting using 8086 microprocessor.
	CO4	Design and interface different peripherals with ARM.
	CO5	Design and interface for DAC and LCD.

Course Title: **FINITE AUTOMATA AND FORMAL LANGUAGES**

Subject Code :22CS45A	**Credit : 3**	**CIE: 50**
Number of Lecture Hours/Week(L:T:P)	**3:0:0 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**42**	**SEE Hours: 03**

Pre-requisites: Mathematical Foundations of Computer Science

Course objectives:

- To gain an understanding of automata theory principles
- Familiarize applications of automata theory in compiler construction and text processing.

Modules	Teaching Hours
Module I **Introduction to Finite Automata:** Introduction to Finite Automata, The central concepts of Automata theory; Deterministic finite automata, Nondeterministic finite automata, An application of finite automata, Finite automata with Epsilon-transitions.	**09 Hrs**
Module II **Regular Expressions, Regular Languages and Properties:** Regular expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions. **Regular Languages and Properties:** Regular languages, Proving languages not to be regular languages, Closure properties of regular languages.	**08 Hrs**
Module III **Properties of Regular Languages and Context Free Grammars:** Decision properties of regular languages, Equivalence and minimization of automata. **Context-Free Grammars and L anguages:** Context –free grammars, Parse trees, Applications, Ambiguity in grammars and Languages.	**08 Hrs**
Module IV **Pushdown automata:** Definition of the Pushdown automata, The languages of a PDA; Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **Properties of context-free languages**: Normal forms for CFGs, The pumping lemmafor CFGs, Closure properties of CFL.	**09 Hrs**
Module V **Introduction to Turing Machine:** Problems that Computers cannot solve, The turning machine, Programming techniques for Turning Machines, Extensions to the basic Turning Machines, Turing Machine and Computers. **Undecideability:** A Language that is not recursively enumerable, An Undecidable problem that is RE, Post's Correspondence problem, Other undecidable problems.	**08 Hrs**

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text books:

1. Introduction to Automata Theory, Languages and Computation – John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman:, 3rd Edition, Pearson education, 2007.

Reference Books:

1. Raymond Greenlaw, H.JamesHoove, Morgan Kaufmann, Fundamentals of the Theory ofComputation: Principles and Practice –, 1998.

2. John C Martin, Introduction to Languages and Automata Theory –3rd Edition, Tata McGraw-Hill, 2007.

3. Daniel I.A. Cohen, Introduction to Computer Theory –2nd Edition, John Wiley & Sons,2004.

4. Thomas A. Sudkamp,An Introduction to the Theory of Computer Science, Languages andMachines –3rdEdition, Pearson Education, 2006.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CS45A	**CO1**	Design Deterministic and non Deterministic finite automata for a Given language and identify related applications in text processing.
	CO2	Construct Regular expressions for given language and describe properties of regular language.
	CO3	Develop Context Free Grammar and illustrate with its applications
	CO4	Design PDA, discuss equivalence of CFG and PDA and explain Properties of Context Free Languages.
	CO5	Illustrate Turing machine concepts and its variants and the notion of undecidability.

Course Title: **BIOLOGY FOR ENGINEERS**

Subject Code : 22BSC46	**Credit : 3**	**CIE: 50**
Number of Lecture Hours/Week(L:T:P)	**3:0:0 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**42**	**SEE Hours: 03**

Pre-requisites: Basic Science

Course objectives:

- To familiarize the students with the basic biological concepts and their engineering Applications.
- To enable the students with an understanding of biodesign 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

Modules	**Teaching Hours**
Module-I **Introduction To Biology:** The cell: the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules; Enzymes (Classification (with one example each),Properties and functions), vitamins and hormones.	**08 Hrs**
Module-II **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 (glucoseoxidase in biosensors, lignolytic enzyme in bio-bleaching).	**08 Hrs**

Module-III **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).	**09 Hrs**
Module-IV **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), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs)	**08 Hrs**
Module-V **Trends In Bioengineering (Qualitative):** Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis), scaffolds and tissue engineering, Bioprinting 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, Bioimaging and Artificial Intelligence for disease diagnosis. Self healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).	**09 Hrs**
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module**.**	
Text books: **Suggested Learning Resources: Books** 1. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Publishing, Bengaluru, 2023.· 2. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022· 3. 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.· 4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011· 5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.· 6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.· 7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.·	

8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.·
9. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.·
10. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
11. 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

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22BSC46	CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
	CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
	CO3	Corroborate the concepts of biomimetics for specific requirements
	CO4	Think critically towards exploring innovative biobased solutions for socially relevant problems.

Course Title: **Universal Human Values**

Subject Code: 22UHV47	**Credit : 1**	**CIE: 50**
Number of Lecture Hours/Week (L:T:P:S)	**0:2:0 Hrs**	**SEE: 50**
Total Number of Lecture Hours	**30 Hrs**	**SEE Hours: 01**

Course objectives:

This course is intended to:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations ofall human beings.
- 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 basisof Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
- 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 courseoutcomes.

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematicand rational 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 beadopted so that 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 documenting students' 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 beginwith, and then to continue within the student in every activity, leading to continuous self evolution.
7. Encourage the students for group work to improve their creative and analytical skills.

Modules	**Teaching Hours**
Module-I **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 Basic Human Aspirations	**06 Hrs**

Module-II **Harmony in the Human Being :** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**06 Hrs**
Module-III **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.	**06 Hrs**
Module-IV **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 of Harmony in Existence	**06 Hrs**
Module-V **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 towards Value-based Life and Profession	**06 Hrs**

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:

1. Ethical human conduct
2. Socially responsible behaviour
3. Holistic vision of life
4. Environmentally responsible work
5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.

The first test will be administered after 40-50% of the syllabus has been covered, and the secondtest will be administered after 85-90% of the syllabus has been covered

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to50 marks

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomyas per the outcome defined for the course.

Semester End Examinations (SEE)

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 maximum marks meant for SEE.

Web links and Video Lectures (e-Resources):

- Value Education websites,
- https://www.uhv.org.in/uhv-ii,
- http://uhv.ac.in,
- http://www.uptu.ac.in
- Story of Stuff,
- http://www.storyofstuff.com
- Al Gore, An Inconvenient Truth, Paramount Classics, USA
- Charlie Chaplin, Modern Times, United Artists, USA
- IIT Delhi, Modern Technology – the Untold Story
- Gandhi A., Right Here Right Now, Cyclewala Productions
- https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
- https://fdp-si.aicte-india.org/8dayUHV_download.php
- https://www.youtube.com/watch?v=8ovkLRYXIjE
- https://www.youtube.com/watch?v=OgdNx0X923I
- https://www.youtube.com/watch?v=nGRcbRpvGoU
- https://www.youtube.com/watch?v=sDxGXOgYEKM

Course Title: WEB APPLICATION DEVELOPMENT LAB		
Subject Code:22CSAE481	**Credit : 1**	**CIE:50**
Number of Practical Hours/Week (L:T:P)	**0:0:2 Hrs**	**SEE:50**
		SEE Hours:03

Prerequisites: Knowledge of Basic Programming languages, HTML basics.

Course Objectives:

- Provide the principles and programming skills for development of Web applications.
- Enables students to develop skills for client/server programming and database applications Management.

LIST OF PROGRAMS

1.Create an HTML documents to study various HTML tags, style sheets and the tag, Borders, padding, color, and the tag.

2. Develop a JavaScript embedded HTML file for.

a) Generating Sum of n numbers. Use alert window to display the result

b) Determine the roots of Quadratic Equation. Use document. Write to produce output.

3. Learn various array and object operations and perform the following operations:

a) Create an empty array with name 'todoList'

b) Use 'push' operation on the 'todoList' array to add few objects each having 'id' as key and string as value (for ex {id:"a"},{id:"b"})

c) Use 'pop' operation to remove the last element from the 'todoList' array.

d) Use 'filter' operation to return a new array of objects with no object having id as "a"

4. Create a modal window using absolute positioning in CSS and use JavaScript for opening and closing the modal.

5. Learn basic flex commands and design a price card using flexbox for positioning of elements.

6. Design a website which dynamically adds and removes contents (To-Do list) using flexbox.

7. Analyze the working of CSS grid layout and create a website using grid layout.

8. Develop a weather website using REST API in JavaScript and use CSS Grid for positioning.

9. Write a PHP program to store current data-time in a COOKIE and display the Last visited on "date-time on the web page upon reopening the same page.

10. Run SQL queries to do the following: create a database, create table, insert rows in a table, fetch rows from a table, delete a row, and update a row.

11. On any HTML page, include a link for Login. Write a login page having login/password fields. Write JavaScript code to validate the login-id and password for the following: both are properly formed and at least 6 bytes long; the password contains at least one special case, one capital and one numeric character; convert the password into its MD5 hash use table created in experiment

12. Open ended experiment: Using bootstrap tool develop an e commerce website.

Question paper pattern:
For SEE similar question related to the above programs will be asked.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CSAE481	CO1	Design of Static web programming using HTML.
	CO2	Create web pages using HTML, Cascading Style Sheets, JavaScript.
	CO3	Design and implement dynamic Web pages with server side Information using Perl.
	CO4	Write PHP programs to for client server interaction.
	CO5	Develop database applications using MySQL database with PHP.