MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)

Autonomous Programmes

Bachelor of Engineering

DEPARTMENT OF

INFORMATION SCIENCE AND ENGINEERING

SYLLABUS

III & IV Semester (2023 Admitted Batch)

(2nd Year)

Academic Year 2024-25

VISION

The department will be a premier centre focusing on knowledge dissemination and generation to address the emerging needs of information technology in diverse fields.

MISSION

1. To make students competent to contribute towards the development of IT field
2. Promote learning and practice of latest tools and technologies among students and prepare them for diverse career options
3. Collaborate with industry and institutes of higher learning for Research and Development, innovations and continuing education
4. Developing capacity of teachers in terms of their teaching and research abilities
5. Develop software applications to solve engineering and societal problems

PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

Graduates will:

PEO1: be successful professionals in IT industry with good design, coding and testing skills, capable of assimilating new information and solve new problems

PEO2: communicate proficiently and collaborate successfully with peers, colleagues and organizations

PEO3: be ethical and responsible members of the computing profession and society

PEO4: acquire necessary skills for research, higher studies, entrepreneurship and continued learning to adopt and create new applications

PROGRAM OUTCOMES(POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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

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

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

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

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

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

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Information Science & Engineering will be able to:

1. Design and Develop efficient information systems for organizational needs.
2. Ability to adopt software engineering principles and work with various standards of Computing Systems.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
THREE CIE's conducted for a total of 30 marks	30
Activities as decided by course faculty	20
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course coordinator	**10**
Record Writing	**20**
Laboratory CIE conducted by the Course coordinator	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum marks to qualify
CIE	**50**	**20**
SEE	**50**	**20**

MALNADCOLLEGEOFENGINEERING, HASSAN

Scheme of Teaching and Examinations 2023 Admitted

Outcome Based Education(OBE)and Choice Based Credit System(CBCS)

IIISEMESTER

Sl. No	Course category & Course Code		Course Title	Teaching Hours /Week			Credits	Examination			
				Theory Lecture	Tutorial	Practical/ Drawing		Duration in hour	CIE Marks	SEE Marks	Total Marks
				L	T	P	C				
1	BSC	23MAIS301	Mathematics for Information Science-I	3	1	2	4	6	50	50	100
2	IPCC	23IS302	Digital Design &Computer Organization	3	0	2	4	5	50	50	100
3	IPCC	23IS303	Operating Systems	3	0	2	4	5	50	50	100
4	PCC	23IS304	Data Structures andApplications	3	0	0	3	3	50	50	100
5	PCCL	23IS305	Unix Lab	0	0	2	1	2	50	50	100
6	ESC	23IS306	ESC/ETC/PLC	2	0	2	3	4	50	50	100
7	UHV	23SCR	Social Connect and Responsibility	0	0	2	1	2	100	---	100
8	AEC/ SEC	23IS307	Ability Enhancement Course/Skill Enhancement Course - III	The course is a Theory: 1	0	0	1	01 / If a course is a laboratory: 02	50	50	100
				If a course is a laboratory: 0	0	2					
9	PCCL	23IS308	Data Structures and Applications laboratory	0	0	2	1	2	50	50	100
10	MC	23NYP1	NSS,YOGA,PE	0	0	2	A	2	100		100
11	BSC	23BCM301	Bridge Mathematics-I(Mandate Audit Course for Diploma entry students)	3	0	0	A	3*	50	50	100
	Total						22	33*	600	400	1000

Course Category:

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course(Non-credit),**AEC**:AbilityEnhancementCourse,**SEC**:SkillEnhancementCourse, **SDA**: Skill Development Activity, **ESC**: Engineering Science Course, **ETC**: Emerging Technology Course

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)			
23IS306A	OOP with Java	23IS306C	Discrete Mathematical Structures
23IS306B	OOP with C++	23IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
23IS307A	R Programming	23IS307C	Data Visualization with Python
23IS307B	Data Analytics with Excel	23IS307D	Version Controller with GiT

MALNADCOLLEGEOFENGINEERING, HASSAN

Scheme of Teaching and Examinations 2023 Admitted

Outcome Based Education(OBE)and Choice Based Credit System(CBCS)

IV SEMESTER

Sl. No	Course category & Course Code		Course Title	Teaching Hours /Week			Credits	Examination			
				Theory Lecture	Tutorial	Practical/ Drawing		Duration in hour	CIE Marks	SEE Marks	Total Marks
				L	T	P	C				
1	BSC	23MAIS401	Mathematics for Information Science- II	3	1	2	4	6	50	50	100
2	IPCC	23IS402	Microprocessor and Microcontroller	3	0	2	4	5	50	50	100
3	IPCC	23IS403	Database Management Systems	3	0	2	4	5	50	50	100
4	PCC	23IS404	Design and Analysis of Algorithm	3	0	0	3	3	50	50	100
5	ESC	23IS405	ESC/ETC/PLC	2	0	2	3	4	50	50	100
6	AEC/ SEC	23IS406	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory: 1 / 0 / 0 If a course is a laboratory: 0 / 0 / 2			1	1 2	50	50	100
7	BSC	23BEIS407	Biology For Engineers	0	0	2	1	2	50	50	100
8	UHV	23UHV	Universal Human Values	0	2	0	1	2	100	---	100
9	PCCL	23IS408	Design and Analysis of Algorithm laboratory	0	0	2	1	2	50	50	100
10	MC	23NYP2	NSS,YOGA,PE	0	0	2	A	2	100	---	100
	Total						22	33	600	400	1000

Course Category:

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course(Non-credit),**AEC**:AbilityEnhancementCourse,**SEC**:SkillEnhancementCourse, **SDA**: Skill Development Activity, **ESC**: Engineering Science Course, **ETC**: Emerging Technology Course

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)			
23IS405A	C# and .Net Technologies	23IS405C	Optimization Techniques
23IS405B	Internet of Things	23IS405D	Probabiltiy, Stastistics and queing
Ability Enhancement Course – IV			
23IS406A	Green IT and Sustainability	23IS406C	Introduction to web technology
23IS406B	UI/UX laboratory	23IS406D	Technical writing using LATEX

Course Title	Mathematics for Information Science Engineering - I		
Course Code	23MAIS301	L-T-P	(3-1-2) 4
Exam	3 Hrs.	Hours/Week	6
SEE	50 Marks	Total Hours	65(40L+13T+12P)

Course Objective: Students will be able to use appropriate data structures for solving problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Utilise the concept of consistency of system of equations to solve the engineering application problems and compute the number of linearly independent vectors.	1	-
2.	Examine for the existence of diagonalization of matrix, find the suitable matrix of transformations so as to get the required image and analyse the system of equations to compute the number of linearly independent Eigen vectors.	1,2	-
3.	Compute Fourier series of a given function, the orthogonal basis, QR factors of Matrices, and solve homogeneous differential equations using matrices	1	-
4.	Write the python programme for the mathematical procedures connected with linear algebra, Fourier series and Model the real life problems/engineering application problems	1,2,5	-

MODULE – 1	10 Hrs.

Linear Algebra: Importance of Matrices in engineering. Rank of a matrix. Consistency of nonhomogeneous and homogeneous system of equations, Solution of the system of linear equations by Gauss elimination method and Gauss – Seidel iterative method. Linearly dependent and independent vectors.

Applications of solution of system of equations to balance the chemical equations.

Self-Study--Traffic flow problem, to find the suitable combination of food stuff so as to get the desired nutrients as prescribed by a dietician.

MODULE – 2	10 Hrs.

Linear algebra: Orthogonal matrices, Gram Schmidt process, QR-factorization, symmetric matrices and quadratic forms, Matrix method to solve homogeneous differential equations of order 2, degree 1.

Special matrices-matrix of rotation, reflection, translation. To find the matrix of transformation when the image of some points is given.

Self-study: Linear models in business and engineering. Partition matrices, Matrix factorization, Application to computer graphics.

MODULE -3	10 Hrs.

Linear Algebra: Eigen values and Eigenvectors, properties, Illustrative examples,

Applications-Stretching of an elastic membrane, to determine the growth of a population model. Role of Eigen values, eigenvectors in determining natural frequency, Rayleigh power method to find the highest Eigen value.

Diagonalization and powers of 3X3 matrices when Eigen values are already given.

Self-Study-- Stability analysis of differential equations which governs the dynamical systems using the concept of Eigen value, eigenvectors. Applications of system of equations, linear transformation in computer science. Application of Eigen value eigenvectors in data compression, Signature testing, Face recognition. Google page ranking.

MODULE -4	**10 Hrs.**

Fourier Series: Periodic functions and their graphical representation, to find the function for standard graphs, to find Fourier series by change of interval method, To represent the experimental data as a Fourier series using the method - Practical harmonic analysis. application of Fourier series in engineering-To represent the signal (wave form) in terms of Fourier series, Fourier series representation for the excitation described by the wave form, graphs of Fourier series approximating the given function

Self-Study-- Half range series method. Applications of Fast Fourier transforms, Discrete Fourier transforms in information science engineering.

TUTORIAL:

1. Need to study in rank of a matrix.
2. Examples on rank of a matrix and consistency.
3. Importance of solution of system of equation in application problems traffic flow.
4. Examples on Eigen values and Eigen vectors and dioganalization.
5. A report on role of Eigen values and Eigen vector in engineering.
6. To fit a Fourier series to the experimental data.
7. Examples on Fourier series(change of interval method)
8. A report the application of Fourier series in engineering.
9. Application to Fourier series connected with practical harmonic analysis.
10. Understanding the concept of QR factorization.

Lab components:

1. Find the rank of matrix
2. Solve the system of linear equations
3. Visualization of matrix transformation by rotation, reflection, shear and by composition of transformations
4. Compute Eigen values and Eigen vectors,
5. Diagonalization of given matrix
6. To represent the signal (wave form) in terms of Fourier series
7. To represent the experimental data as a Fourier series using the method - Practical harmonic analysis.

ACTIVITIES:

a. To represent saw tooth periodic motion of a follower operated by a Cam which rotates uniformly, in the form of Fourier series
b. Application of Fourier series to Laplace equation, heat conduction.
c. Fourier series representation for the excitation described by the wave form,

d. Role of Eigen values, eigenvectors in determining natural frequency, mode shapes of equations of motions (Spring mass system).
e. Lenovo input output method – application to balance the economy of a Country.
f. Applications of factorization of matrices-Google recommendation.
g. Jordan canonical form when minimal polynomial and characteristic polynomial is given and its application in Engineering.
h. Diagonalize a matrix and determining the principal stresses.
i. Application of Laplace transformation.
j. Application of Eigen value, Eigen vectors in data compression, Signature testing, Face recognition. Google page ranking.
k. Least square solution of system of equations- a matrix approach

Note – 1. Theorems and properties without proof. Applicable to all the Modules.

2. Self study part is not included for Semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal,	44th edition	Khanna Publications	2016

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced engineering mathematics	R K Jain and S R K Iyengar	2nd	Narosa publishers	2005
2	Calculus	Thomas Finney	2nd	Pearson education	2002

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal,	44th edition	Khanna Publications	2016

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	NPTEl	IIT Madars	2021	http://nptel.ac.in/courses.phd?disciplineID=111

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Laboratory Conduction	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Realize the behavior of following gates: i) AND ii) OR 3) NOT 4) NOR 5) NAND
2	Design and implement BCD to Excess-3 code converter
3	Simplify and realize given Boolean expressions using logic gates (y = C'+A'D'+B'D').
4	Given any 4-variable logic expression (y = C'+A'D'+B'D'), simplify using a Karnaugh Map and realize the simplified logic expression using 8:1 Multiplexer IC
5	Design and implement a 3 stage Asynchronous Counter using J-K flip flops to count down from 7 to n .
6	Design Verilog code to realize all the logic gates
7	realize the simplified logic expression using multiplexer and simulate the same using VHDL/ Verilog
8	realize the simplified logic expression using de-multiplexer and simulate the same using VHDL/ Verilog
9	Realize the truth tables of half adder and simulate the same using VHDL/ Verilog
10	Realize a Verilog code for the following flip-flops: SR, D, JK and simulate the same using VHDL/ Verilog

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**-**												
CO2	**3**	**2**												
CO3	**3**	**-**												
CO4	**3**	**2**			**1**									

Course Title	Digital Design and Computer Organization		
Course Code	23IS302	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: Students will be able to design synchronous and asynchronous circuits. Also will understandthe basic organization of a computer.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the behavior of basic components of Digital circuits and Apply different methods for simplifying Boolean equations and design circuits	1	-
2	Analyze the working/functionality of different data processing circuits, memory organizations and cache mapping policies.	3	-
3	Understand the instruction execution mechanism of a computer, working of processing unit, input/output operations,	1	-
4	Carryout the task of implementing combinational and sequential logic circuit from functional description of digital systems	5	-

MODULE-1 **9 Hrs.**

Digital Logic: Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positiveand Negative Logic. Combinational Logic Circuits: Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't Care Conditions, Product-of-Sums method, Sum-of-Products method Simplification by Quine-McCluskey Method

Data-Processing Circuits: Multiplexers, Demultiplexers, EX-OR gates, Parity Generators and Checkers

MODULE-2 **9 Hrs.**

Data-Processing Circuits (contd..): Magnitude Comparator.

Arithmetic Circuits: Arithmetic Building Blocks, **Flip-Flops**: RS Flip-Flops, Gated Flip-Flops, Edge- triggered RS, D, JK Flip-Flops, JK Master-Slave Flip-Flops, Various Representations of Flip-Flops, **Registers**: Registers: Types of Registers, Serial In-Serial Out, Serial In-Parallel Out, Parallel In-Serial Out,Parallel In-Parallel Out.

Counters: Asynchronous Counters.

MODULE-3 **9 Hrs.**

Basic Structure of Computers: Basic Operational Concepts**,** Numbers, Arithmetic Operations and Characters,Memory Location and Addresses**.**

Input/Output Organization: Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling MultipleDevices. Direct Memory Access, Standard I/O Interfaces – PCI Bus, USB.

MODULE-4 **9 Hrs**

Memory System: Basic Concepts, Semiconductor RAM Memories(till Asynchronous DRAMS), Read OnlyMemories, Cache Memories – Mapping Functions.

Arithmetic: Multiplication of positive numbers, Signed Operand Multiplication, Fast multiplication-Bit pairrecoding of multipliers**,** Integer Division.

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Digital Principles andApplications	Donald P Leach, Albert PaulMalvino and Goutam Saha	8th	McGra wHill	2017
2	Computer Organizationand Embedded Systems	Carl Hamacher, Zvonko Vranesic , Safwat Zaky, Naraig Manjikian	6th	Tata McGra w Hill	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Computer Organization &Architecture	William Stallings	7th	PHI	2006
2	Computer Organization andDesign	David A Patterson, John L Hennessy-he Hardware/ software Interface ARM Edition	4th	Elsevier	2009

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	COMPUTER ORGANIZATION ANDEMBEDDED SYSTEMS	Carl Hamacher, Zvonko Vranesic , Safwat Zaky, Naraig Manjikian	6th	Tata McGra wHill	2012

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Computer architectureand organization	Prof. Indranil Sengupta, Prof. Kamalika Datta | IIT Kharagpur	2021	https://onlinecourses.nptel.ac.in/noc21_cs61/preview
2	Digital Design withVerilog	Prof. Chandan Karfa,Prof. Aryabartta Sahu | IIT Guwahati	2024	https://onlinecourses.nptel.ac.in/noc24_cs61/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Laboratory Conduction	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Realize the behavior of following gates: i) AND ii) OR 3) NOT 4) NOR 5) NAND
2	Design and implement BCD to Excess-3 code converter
3	Simplify and realize given Boolean expressions using logic gates (y = C'+A'D'+B'D').
4	Given any 4-variable logic expression (y = C'+A'D'+B'D'), simplify using a Karnaugh Map and realize the simplified logic expression using 8:1 Multiplexer IC
5	Design and implement a 3 stage Asynchronous Counter using J-K flip flops to count down from 7 to n .
6	Design Verilog code to realize all the logic gates
7	realize the simplified logic expression using multiplexer and simulate the same using VHDL/ Verilog
8	realize the simplified logic expression using de-multiplexer and simulate the same using VHDL/ Verilog
9	Realize the truth tables of half adder and simulate the same using VHDL/ Verilog
10	Realize a Verilog code for the following flip-flops: SR, D, JK and simulate the same using VHDL/ Verilog

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2			3											
CO3	3													
CO4					3			3		3				

Course Title	Operating Systems		
Course Code	23IS303	(L-T-P)C	(3-0-2) 4
Exam	3 Hours	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: Students will be able to implement different components of operating systems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various concepts and functionalities of operating systems	1,2	-
2	Apply different Process scheduling , Disk Scheduling and memory management Algorithms	3	-
3	Apply different mechanisms for handling deadlocks and synchronization problems	3	-
4	Implement various CPU scheduling algorithms , disk scheduling, page replacement algorithms	2,3	-

MODULE-1	9 Hrs.

Introduction to Operating Systems, System Structures: What Operating Systems Do? Computer System Architecture; Operating System Structure; Operating System Operations; Operating System Services; System Calls; Types of System Calls; System Programs, Process Management: Process Concept; Operations on Processes; Inter-Process Communication. Multi-Threaded Programming: Overview; Multithreading Models.

MODULE-2	9 Hrs.

Process Management (contd..): Process Scheduling: Basic Concepts; Scheduling Criteria; Scheduling Algorithms; Process Synchronization: The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Semaphores; Classic problems of Synchronization, Monitors- Usage, Dining-Philosophers solution using monitors.

MODULE-3	9 Hrs.

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	9 Hrs

Virtual Memory Management: Background; Demand Paging; Page Replacement. Storage Management: Secondary Storage Structures, Protection: Mass Storage Structures; Disk Structure; Disk Scheduling; Swap Space Management. Protection: Goals of Protection, Principles of Protection, Domain of Protection-Domain Structure, Access Matrix, Implementation of Access Matrix.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	9th Edition	John Wiley & Sons	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Modern Operating Systems - A Concept Based Approach	Andrew.S.Tanen baum	4th Edition	Addison Wesley	2015
2	Introduction to OperatingSystems: Concepts and Practice	P.C.P. Bhatt	2nd Edition	PHI	2008
3	Operating Systems Internals and Design Principles	William Stallings	8th Edition	Tata McGraw-Hill Education	2007

E Books:

Sl.No	Book Title	Link
1	Operating System Concepts	https://drive.uqu.edu.sa/_/mskhayat/files/MySubjects/2017SS%20Ope ra ting%20Systems/Abraham%20Silberschatz-Operating%20System%20Concepts%20(9th,2012_12).pdf

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Fundamentals of Operating System	NPTEL	2024	https://nptel.ac.in/courses/106/105/106 105214/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Lab Program Execution	20
Total		**50**

Laboratory Plan:

Program Details	
1.	Write a C program for performing the following file handling operations a. Creation of the new file b. Opening an existing file c. Reading from the file d. Writing to the file e. Appending the file f. Copying the file g. Renaming the file
2.	Design and develop C program for implementing first come first serve and shortest jobfirst algorithm
3.	Design and develop C program for implementing round robin scheduling algorithms.
4.	Design and develop C program to implement first in first out and optimal page replacement algorithm.
5.	Design and develop C program to implement the producer consumer program usingsemaphore.
6.	Design and develop C program to simulate banker's algorithm to avoid a deadlock.
7.	Design and develop C program to simulate the best fit and the worst fit contagious memory allocation techniques.
8.	Design and develop C program to simulate the following disk scheduling algorithms a. FCFS b. Scan c. SSTF d. LOOK

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-

Course Title	Data Structures and Applications		
Course Code	23IS304	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to use appropriate data structures for solving problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various operations on data structures like Arrays, Lists, Stacks, Queues and Trees.	1	-
2	Apply linear and non-linear data structures for solving problems.	2	1
3	Design solutions for problems using appropriate data structures.	2	1
4	Develop programs to solve a problem using data structures like stack, queue, list and tree.	2	2

MODULE – 1 — 10 Hrs.

Introduction to Data Structures: Definition, Classification of Data Structures, Dynamic Memory Allocation – Introduction, Dynamic memory allocation, malloc, calloc, free and realloc.The Stack - Definition and examples: Primitive operations, Example. Representing stacks in C: Implementing the pop operation, testing for exceptional conditions, implementing the push operation. **Infix, postfix and prefix:** Basic definitions and examples, evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix.

MODULE – 2 — 10 Hrs.

Recursion: Recursive definition and processes: Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. **Recursion in C:** Factorial of a number, generation of Fibonacci numbers, Binary searching,Concept of Recursive chains, Towers of Hanoi problem, **Queues and lists:** The queue and its sequential representation: C implementation of queues, Insert operation, Priority queue, Array implementation of a priority queue. **Linked lists:** Inserting and removing nodes from a list, Linked Implementation of stacks. Getnode and freenode operations.

MODULE -3 — 10 Hrs.

Lists in C: Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, linked lists using dynamic variable, Queues as lists in C, Examples of list operations in C, Non integer and non-homogeneous lists. **Other list structures:** Circular lists, Stack as a circular list, Queue as a circular list.

MODULE -4	10 Hrs.
Trees - Binary trees: Operations on binary trees, Applications of binary trees. Binary tree representation: Node representation of binary tree, Internal and external node, Implicit array representation of binary trees, choosing a binary tree representation, Binary tree traversals in C, Threaded binary trees.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data structures using C and C++, PHI,	Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum,	2nd	Pearson Education	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Structures: A Pseudo-code approach with C	Gilberg and Forouzan	2nd	Cengage Learning	2014
2	Programming techniques through C -A beginner's companion,	M.G.Venkateshmurthy ,	2nd	Pearson Education	2002
3	An Introduction to Data Structures withApplications	*Jean-Paul Tremblay & Paul G. Sorenson,.*	2nd	*McGraw Hill*	2013

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data structures using C and C++, PHI,	Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum,	2nd	Pearson Education	2015

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Data Structures and algorithms		2022	https://nptel.ac.in/courses/106/102/106102064/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity- Students will demonstrate concepts of Tower of Hanoi, Tree constructions, Queues & List , etc., using real Life activities.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2		3											2	
CO3		3											2	
CO4		2												2

Course Title	UNIX LABORATORY		
Course Code	23IS305	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

Course Objective: The course provides a comprehensive introduction to UNIX user commands andutilities and students will develop Shell Programming and Vi editing skills.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Execute the basic UNIX commands.	2	-
2.	Demonstrate and develop UNIX shell scripts	3	1
3.	Illustrate and construct UNIX shell scripts, similarly, craft scripts related to AWK.	3	1

Laboratory Plan:

Part A : Execution of following basic UNIX commands

Lab Program	Program Details
1	ls ,ls –l , ls-lh , ls-a , ls-R , ls –d, cat, cd ,od , mkdir,echo ,date , mv , cal ,wc,pwd,rmdir,rm ,touch,sort ,read, clear,ps-u , ps whoami, alias , find ,test,expr,set ,shift ,type ,grep ,sed,awk,tr,chmod,job,cut,paste,top,env,Bash

Part B : Design and Develop a shell scripts for following statements

Lab Program	Program Details
1.	Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this Maximum value to the standard output.
2.	. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.
3.	Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions.

4.	4. Create a script file called file-properties that reads a file name entered and outputsit properties.
5.	Write a shell script that accept one or more filenames as argument and convert all ofthem to uppercase, provided they exist in current directory
6.	Write a shell script that accepts as filename as argument and display its creation timeif file exist and if it does not send output error message
7.	Write a shell script that gets executed displays the message either “Good Morning” or“Good Afternoon” or “Good Evening” depending upon time at which the user logs in.
8.	Write a shell script that accept the file name, starting and ending line number as anargument and Display all the lines between the given line number.
9.	Write an awk script to compute gross salary of an employee accordingly to rule givenbelow. If basic salary is < 10000 then HRA=15% of basic & DA=45% of basic If basic salary is >=10000 then HRA=20% of basic & DA=50% of basic.
10.	Write an awk script to delete duplicated line from a text file. The order of the originallines must remain unchanged.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	UNIX :Concepts and Applications	Sumitabha Das	4th	Tata McGraw-Hill,	2018.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Unix& Shell Programmng	M. G. Venkateshmurthy	4th	Pearson Education	2018
2	UNIX and Shell Programming	Behrouz A. Forouzan and Richard F.Gilberg	4th	A Textbook, 1st Edition,Thomson Course Technology	2018

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Linux Programming & Scripting	**NPTEL**	2021	https://archive.nptel.ac.in/courses/117/106/117106113/
2	Linux Basics	NPTEL	2022	https://nptel.ac.in/courses/11710611 3

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Conduct two tests, each worth 25 marks, andcombine them to make a total of 50 marks.	50
Total		**50**

Note:
Part A: Students need to execute two commands.
Part B: Students need to execute one shell script.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		3												
CO2			2										3	
CO3			2										3	

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	23IS306A	(L-T-P)C	(2-0-2) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40 (26L + 14P)

Course Objective: Students will be able to apply Object Oriented Programming concepts for designing Applications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Comprehend the fundamental concepts of Object Oriented Programming	1, 2	1
2	Apply Object Oriented constructs for program development	2	1
3	Develop computer programs to solve real world problems in Java	1, 2	1
4	Use any tool to develop and debug JAVA code.	5	1

MODULE-1	7 Hrs.

The History & Evaluation of Java: Java's Lineage, The Creation of Java, The Evalution of Java, Java SE 8
An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords).
Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables.

MODULE-2	7 Hrs.

Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ?Operator, Operator Precedence, Using Parentheses.
Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection.

MODULE-3	6 Hrs.

Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, AccessControl, Understanding static, Introducing final, Introducing Nested and Inner Classes.
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed,Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance

MODULE-4	6 Hrs

Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface
Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch,
Multiple catch Clauses, throw, Java's Built-in Exceptions, Customized exceptions.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Java the Complete Reference	Herbert Schildt	13th	Tata McGraw Hill	2024

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to JAVA Programming, Brief Version	Y. Daniel Liang	9th	Pearson Education	2019

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Java the Complete Reference	Herbert Schildt	13th	Tata McGraw Hill	2024

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Programming in Java	IIT Kharagpur	2024	https://onlinecourses.nptel.ac.in/noc24_cs105/preview
2	Object Oriented Programming in Java	University of California San Diego	2023	https://www.coursera.org/learn/object-oriented-java

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Lab Conduction	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Write a Java Program that grades multiple-choice tests. Suppose there are 'm' students and 'n' Questions, and the answers are stored in a two-dimensional array. Each row records a student's answers to the questions. The answer key is stored in a one-dimensional array. The program grades the test and displays the result.
2	Write a Java program to count the number of occurrences of each letter in a string regardless of case.
3	Write a Java program that ignores non-alphanumeric characters in checking whether a string is a palindrome.
4	Create a java program to make a calculator using switch case to do arithmetic operations.
5	Create a Class Vehicle. Demonstrate method overriding by considering any two types of vehicles.
6	Create a super class called Figure that stores the dimensions of a two-dimensional object. Using Dynamic polymorphism in Java, compute the area of any three two-dimensional figures.
7	Write a Java program to demonstrate use of interfaces for computing the Net balance Amount after considering Gross income and expenditures in an Employee of an organization.
8	Write a program to demonstrate use of extending interfaces.
9	Write a java program to demonstrate handling of Array Index Out Of Bounds Exception and Arithmetic Exception.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2		3											3	
CO3	3	3											3	
CO4					3								3	

Course Title	OBJECT ORIENTED PROGRAMMING WITH C++		
Course Code	22IS306B	(L-T-P)C	(2-0-2)3
Exam	3Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	40 (26L+14P)

Course Objective : Students will be able to apply object oriented programming concepts in development ofapplications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe all concepts of OOPs	1	
2.	Conduct experiments to demonstrate OOPs concepts	2	1
3.	Develop solutions to problems using OOPs principles	2	1

MODULE – 1	7 Hrs.

Principles of Object Oriented Programming: Object Oriented Programming Paradigm; Basic concepts of Object Oriented Programming; A Simple C++ Program; More C++ Statements; An Example with Class; Structure of C++ Program; Creating the Source File; Compiling and linking.Functions in C++: Introduction; The Main Function; Function Prototyping; Call by Reference; Return by Reference; Inline Function; Default Arguments; Const Arguments; Functions Overloading;

MODULE – 2	7 Hrs.

Classes and Objects: Specifying a Class; Defining Member Functions; A C++ Program with Class; Making an Outside Function Inline; Nesting of Member Functions; Memory Allocation for Objects; Static Data Members; Static Member Functions; Array of Objects; Objects as Function Arguments; Constructors and Destructors: Introduction; Constructors; Parameterized Constructors; Destructors.

MODULE -3	6 Hrs.

Operator Overloading and Type Conversions: Introduction; Defining Operator Overloading; Overloading Unary Operators; Overloading Binary Operators; Manipulation of String Using Operators; Rules for Overloading Operators; Inheritance; Extending Classes;Introduction; Defining derived Classes; Single Inheritance; Making a Private Member Inheritable; Multilevel Inheritance; Hierarchical Inheritance; Hybrid Inheritance;

MODULE -4	6 Hrs.

Templates: Introduction; Class Templates; Class Templates with Multiple Parameters; Function Templates; Function Templates with Multiple Parameters; Exception Handling: Introduction; Basic of Exception Handling; Exception Handling Mechanism; Throwing Mechanism; Catching Mechanism; Rethrowing an Exception; Specifying Exceptions.

Practical Component

1. Implement a simple C++ program to create a class with two data members and three member functions, create objects of this class and call the functions.
2. Using reference variables and inline functions, Implement a C++ program to find the average of three real numbers.
3. Using function overloading concept, Implement a C++ program to
   a. add/ subtract two complex numbers and
   b. add/ subtract a real number to a complex number.
4. Using template function, Perform a generic sorting program and demonstrate the same for integers and real numbers.
5. Overloading the operators ++ and --, Implement a C++ program to create a stack of integers and demonstrate the push and pop operations.
6. Overloading the operators + and -, write a C++ program to
   a. Subtract two given dates and find the difference in days.
   b. Add given number of days to a given date
7. Using friend function concept, demonstrate a C++ program
8. Create a class called A and derive two classes B and C from this. Demonstrate single inheritance with suitable functions.
9. With the help of a Virtual function, demonstrate a C++ program that displays the area and circumference of a Rectangle, Square and a Circle.
10. Implement a C++ program to find the area of rectangle, triangle and sphere. Use function overloading concept
11. Design a C++ program to create a class STUDENT with the following specification: Data members: Name, Roll_no, SGPA. Member Functions: Read and Write. Use these specification to read and print the information of 3 students.
12. Implement a C++ program to
    a. Concatenate two strings, and
    b. Search if the second string is present in the first string.

Text Books:

1. Object- oriented programming with C++,E Balguruswamy, 6th Edition, Tata McGraw Hill, 2014
2. Mastering C++, K R Venugopal, Rajkumar Buyya, Tata McGraw Hill, 2nd Edition, Tata McGraw Hill, 2013.

Reference Books:

1. The Complete Reference C++, Herbert Scheldt, 4th Edition, Tata McGraw Hill, 2012
2. C++ Primer, Stanley B.Lippman, JoseeLajoie, 5th Edition, Pearson Education, 2009.

MOOC Course:

3. https://onlinecourses.nptel.ac.in/noc19_cs38/preview

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**													
CO2		**2**											**3**	
CO3		**3**											**3**	

Course Title	DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS		
Course Code	22IS306C	L-T-P	(2-2-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40

Course Objective: Introduction of Discrete structures and principle of Combinatorics which may be employed as tools inthe applications of Computer Science & Information Technology.

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

#	Course outcomes	Mapping to PO's	Mapping to PSO's
1	Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers	1,2	-
2	Apply induction hypotheses, various methods of proof methodsin decision taking problems.	1,2	-
3	Solve combinatorial problems using counting principles.	1,2	-
4	Apply graph concepts to model and analyse problems of information science & engineering	1,2	-

MODULE-1 **10 Hrs.**

Set theory: A review of set operations, statements of laws of set theory, verification of set identities using Venn diagrams andMembership table. Illustrated examples.
Counting principles: Rule of addition, multiplication principle. Inclusion and Exclusion Principle for 2 and 3 sets, principles of
permutation, combination, generalized permutation and generalized combination principle. Illustrative examples

MODULE-2 **10 Hrs.**

Fundamentals of logic: Basic logic connectives and truth tables. Logical equivalence and Tautologies. Statement of laws ologic. Logic implication - Rules of inference theory.

Methods of proof: Using rules of inference theory, methods of direct and indirect proof.

MODULE-3 **10 Hrs.**

Relations: Cartesian products and relations, computer representation of a relation and directed graph, properties ofrelations, equivalence relations and partitions. Partially ordered set and Hasse diagram.

Functions: Definition, various types of functions - one to one function, onto function, bijective function, invertible functions and function composition Application of Stirling numbers of second kind.

MODULE-4 **10 Hrs.**

Graph theory: Basic terminologies of a graph. Discussion of connected and disconnected graphs, Euler and Hamilton graphs,Planar graphs and Graph colouring.

Trees: Definition, properties of a tree. Weighed trees, prefix codes and biconnected components. Modelling of real-life problems using graphical approach and their analysis.

Text Books:

1. Discrete and Combinatorial Mathematics, R C Grimaldi, Pearson's publications, 5th edition, 2007.

Reference Books:

1. Discrete Mathematical Structures, by D. S. Malik & M. K. Sen, Thomson's Publications, First edition, 2006.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2												
CO2	3	2												
CO3	3	2												
CO4	3	2												

Course Title	GRAPH THEORY AND COMBINATORICS		
Course Code	22IS306D	L-T-P	(2-2-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to understand combinatorics, graphs, trees and their applications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify and explain the properties of various types of graphs	1, 2	
2	Construct different types of trees, identify biconnected components and articulation points	1, 2	
3	Apply the generalized principle of Inclusion and Exclusion theorem	1, 2	
4	Apply the concept of generating functions to solve the given problems of counting theory	1, 2	

MODULE – 1	10 Hrs.

Introduction to Graph Theory: Definitions and Examples, Sub-graphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Circuits and Trails.

Planar Graphs & Graph Coloring: Definition and Examples, A Discussion on Kuratowski Graphs, Detection of Planarity of a
Graph.

MODULE – 2	10 Hrs.

Dual Graphs and Properties of a Dual Graph with Respect to a Planar Graph: Chromatic Number and Chromatic Polynomial of aGraph.

Trees: Definition, Properties, and Examples. Rooted Trees and Binary Trees, Weighed Trees and Prefix Codes. Optimization and
Matching: Transport Networks - Max-Flow Min-cut Theorem.

MODULE -3	10 Hrs.

Fundamentals of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem,Combinations with Repetition. The Catalan Numbers. Pigeon Hole Principle, Advanced Counting Techniques: The Principle of Inclusion and Exclusion – Definition and Illustrative Examples, Generalizations of the Principle

MODULE -4	10 Hrs.

Derangements – Nothing Is In Its Right Place, Rook Polynomials, Arrangements with Forbidden Positions, Generating functions,introductory examples, Definition and examples. Calculational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator.

Text Books:

1. R C Grimaldi, Discrete Mathematics and Combinatorics, Pearson Education, 5th Edition, 2007.

Reference Books:

1. Narsing Deo, Graph Theory with Applications to Engineering and Computer Science, PHI Publications
5. V. Balakrishnan, Combinatorics, Schaum Series, Tata McGraw-Hill Publications

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	2												
CO2	3	2												
CO3	3	**2**												
CO4	3	2												

Course Title	R PROGRAMMING		
Course Code	23IS307A	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: Students will be able to learn and practice programming techniques using R programming.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explain the fundamental syntax of R data types, expressions and the usage of the R-Studio IDE	1	-
2.	Develop a program in R with programming constructs: conditionals,looping and functions.	3	-
3.	Apply the list and data frame structure of the R programming language.	2	-
4.	Use visualization packages and file handlers for data analysis.	3	-

S.N	Experiments
1	Demonstrate the steps for installation of R and R Studio. Perform the following: a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand thedifference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors, matrices and arrays **Suggested Reading** – Text Book 1 – Chapter 1 (What is R, Installing R, Choosing an IDE – RStudio, How to Get Help in R, Installing Extra Related Software), Chapter 2 (Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors), Chapter 3 (Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables)

2	Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: a. Profit for each month. b. Profit after tax for each month (Tax Rate is 30%). c. Profit margin for each month equals to profit after tax divided by revenue. d. Good Months – where the profit after tax was greater than the mean for the year. e. Bad Months – where the profit after tax was less than the mean for the year. f. The best month – where the profit after tax was max for the year. g. The worst month – where the profit after tax was min for the year. **Note:** a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with $0.01 precision, but need to bepresented in Units of $1000 (i.e 1k) with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimalpoint. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data. **Suggested Reading** – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)
3	Develop a program to create two 3 X 3 matrices A and B and perform the following operations
	a) Transpose of the matrix b) addition c) subtraction d) multiplication **Suggested Reading** – Text Book 1 – Chapter 4 (Matrices and Arrays – Array Arithmetic)
4	Develop a program to find the factorial of given number using recursive function calls. **Suggested Reading** – Reference Book 1 – Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)

5	Develop an R Program using functions to find all the prime numbers up to a specifiednumber by the method of Sieve of Eratosthenes. **Suggested Reading** – Reference Book 1 - Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)
6	The built-in data set mammals contain data on body weight versus brain weight. Develop Rcommands to: a) Find the Pearson and Spearman correlation coefficients. Are they similar? b) Plot the data using the plot command. c) Plot the logarithm (log) of each variable and see if that makes a difference. **Suggested Reading** – Text Book 1 –Chapter 12 – (Built-in Datasets) Chapter 14 – (Scatterplots) Reference Book 2 – 13.2.5 (Covariance and Correlation)
7	Develop R program to create a Data Frame with following details and do thefollowing operations.

Item Code	Item Category	Item Price
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

8	Let us use the built-in dataset air quality which has Daily air quality measurements in NewYork, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements. a) Assigning names, using the air quality data set. b) Change colors of the Histogram c) Remove Axis and Add labels to Histogram d) Change Axis limits of a Histogram e) Add Density curve to the histogram **Suggested Reading** –Reference Book 2 – Chapter 7 (7.4 – The ggplot2 Package), Chapter 24 (Smoothing and Shading)
9	Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis. a) Find the total number rows & columns b) Find the maximum salary c) Retrieve the details of the employee with maximum salary d) Retrieve all the employees working in the IT Department. e) Retrieve the employees in the IT Department whose salary is greater than 20000 andwrite these details into another file "output.csv" **Suggested Reading** – Text Book 1 – Chapter 12(CSV and Tab Delimited Files)
10	Using the built in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number ofcylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axleratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburettors. Develop R program, to solve the following:

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Learning R: a step by step function guide to data analysis	Cotton	1st	O'reilly Media Inc	2017

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**													
CO2			**2**											
CO3		**2**												
CO4			**2**											

Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	23IS307B	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: To learn and practice various Data analytics using Excel tool.

Course outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To understand the mathematical calculation performed in Excel.	1,2	-
2	To apply sorting, Filtering and condition format for the various problems.	2,3,5	-

Course Contents:

Guided Laboratory Experiments

1. In a company, 30 employee details (Name, Date of joining, Qualification and salary) are stored in Microsoft Access database and text file. Using Excel tool import the data from different sources for analysis.

2. Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form.

O	S	A	B	C
100>=9	8-8.9	7-7.9	6-6.9	5-5.9

3. Create 10 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.

4. Suppose your customer survey results from the east and west regions, month wise are

MONTH	EAST	WEST	LOW(<50%)	MEDIUM(50%-80%)	HIGH(>80%)
15-Apr	86.40%	63.00%	50%	30%	20%
15-May	45.80%	58.90%	50%	30%	20%
15-Jun	44.10%	81.60%	50%	30%	20%
15-Jul	77.60%	86.10%	50%	30%	20%
15-Aug	80.70%	95.00%	50%	30%	20%

For the above date, display customer satisfaction survey using Band Chart.

5. There is a loan of 5,000,000 for tenure of 30 years. You want to know the monthly payments (EMI) for varied interest rates. You also might be interested in knowing the amount of interest and Principal that is paid in the second year.

6. Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many

	books are sold at the original price to obtain total revenue of 24,500.
7.	Suppose you want to have a report displaying the following − • Data for five disciplines - Archery, Diving, Fencing, Figure Skating and Speed Skating. • Regions that scored more than 80 medals in these 5 disciplines. • The count of medals in each of the five disciplines in each of these regions. • Total count of medals for the five disciplines in each of these regions.
8.	8) Consider the data of 20 employee are stored into two different tables. first table consists of name,employee id and second table consists of employee id ,salary.Find the employee salary using lookup table from second table to first.
9.	9) In Olympic, 20 countries participated and won various medals by male and female in equal propositions. Display the medal count for each country with power view charts (Pie,Column,Bar,Line,Scatter, and Bubble).
10.	Consider the sequence of the data from 1 to 100 where male 48% and female 52% in the data. For the given data, create male vs female info-graphic chart .

MINI PROJECT

- Using conditional formatting to highlight areas.
- Use Pivot tables to analyze data and see trends in the given preferences.
- Creation of charts for analysis
- Include formulas, multiple filters etc..
- Using the VLOOKUP function to find or accessing data.

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**													
COs	**PO1**	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3												
CO2		2	3		3									

Course Title	Data Visualization with Python		
Course Code	22IS307C	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: Students will be able to demonstrate the use of IDLE or PyCharm IDE to create Python Applications

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications.	2	-
2	Use Python programming constructs to develop programs for solving real-world problems.	2	2
3	Use Matplotlib for drawing different Plots.	5	-
4	Demonstrate working with Seaborn, Bokeh for visualization.	2	-

SN	Experiments
1	a) Write a python program to find the best of two test average marks out of three test's marksaccepted from the user. b) Develop a Python program to check whether a given number is palindrome or not and also countthe number of occurrences of each digit in the input number. Datatypes: https://www.youtube.com/watch?v=gCCVsvgR2KU Operators: https://www.youtube.com/watch?v=v5MR5JnKcZI Flow Control: https://www.youtube.com/watch?v=PqFKRqpHrjwFor loop: https://www.youtube.com/watch?v=0ZvaDa8eT5s While loop: https://www.youtube.com/watch?v=HZARImviDxg Exceptions: https://www.youtube.com/watch?v=6SPDvPK38tw
2	a) Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N(where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions. Functions:https://www.youtube.com/watch?v=BVfCWuca9nw Arguments:https://www.youtube.com/watch?v=ijXMGpoMkhQ Return value: https://www.youtube.com/watch?v=nuNXiEDnM44
3	a) Write a Python program that accepts a sentence and find the number of words, digits, uppercaseletters and lowercase letters. b) Write a Python program to find the string similarity between two given stringsSample Output: Sample Output: Original string: Original string: Python Exercises Python Exercises Python Exercises Python Exercise Similarity between two said strings: Similarity between two said strings:1.0 0.967741935483871 Strings: https://www.youtube.com/watch?v=lSItwlnF0eU String functions: https://www.youtube.com/watch?v=9a3CxJyTq00

4	a) Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib. b) Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib. https://www.youtube.com/watch?v=RRHQ6Fs1b8w&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&inde x=3 https://www.youtube.com/watch?v=7ABCuhWO9II&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&inde x=4
5	a) Write a Python program to Demonstrate how to Draw a Histogram Plot using Matplotlib. b) Write a Python program to Demonstrate how to Draw a Pie Chart using Matplotlib. https://www.youtube.com/watch?v=Qk7caotaQUQ&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&inde x=6 https://www.youtube.com/watch?v=PSji21jUNO0&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index =7
6	a) Write a Python program to illustrate Linear Plotting using Matplotlib. b) Write a Python program to illustrate liner plotting with line formatting using Matplotlib. https://www.youtube.com/watch?v=UO98lJQ3QGI&list=PL-osiE80TeTvipOqomVEeZ1HRrcEvtZB_
7	Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions. https://www.youtube.com/watch?v=6GUZXDef2U0
8	Write a Python program to explain working with bokeh line graph using Annotations and Legends. a) Write a Python program for plotting different types of plots using Bokeh. https://www.youtube.com/watch?v=HDvxYoRadcA
9	Write a Python program to draw 3D Plots using Plotly Libraries. https://www.youtube.com/watch?v=cCck7hCanpw&list=PLE 50- dh6JzC4onXqkv9H3HtPbBVA8M94&index=4
10	a) Write a Python program to draw Time Series using Plotly Libraries. b) Write a Python program forcreating Maps using Plotly Libraries. https://www.youtube.com/watch?v=xnJ2TNrGYik&list=PLE50-dh6JzC4onXqkv9H3HtPbBVA8M94&index=5 https://www.youtube.com/watch?v=D35m2CdMhVs&list=PLE50-dh6JzC4onXqkv9H3HtPbBVA8M94&index=6

Text Books:

1. Al Sweigart, “Automate the Boring Stuff with Python”,1stEdition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2. Reema Thareja “Python Programming Using Problem Solving Approach” Oxford University Press.
3. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2015.(Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf)
4. Jake VanderPlas “Python Data Science Handbook” 1st Edition, O’REILLY.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		**2**												
CO2		**2**												2
CO3					**3**									
CO4		**2**												
CO5					**3**									

Course Title	DATA STRUCTURES AND APPLICATIONS LABORATORY		
Course Code	23IS308	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: This laboratory course enables students to get practical experience in design, develop, implement, analyze.

Course outcomes: the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyze various linear and non-linear data structures	2	
2	Demonstrate the working nature of different types of data structures and their applications	2,3	
3	Use appropriate searching and sorting algorithms for the given scenario.	2	1
4	Apply the appropriate data structure for solving real world problems	2,3	1

Course Contents:

Guided Laboratory Experiments

1.	Design and Implement a menu driven Program in C for the following Array operations: 1.Creating an Array of N Integer Elements 2.Display of Array Elements with Suitable Headings 3.Inserting an Element (ELEM) at a given valid Position (POS) 4.Deleting an Element at a given valid Position (POS)
2.	Illustrate the concepts of malloc(), calloc(),realloc() for the dynamic allocation of memory
3.	Write a C Program to create a class called STACK to store Integers for the following operations (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate Overflow and Underflow situations on Stack
4.	Write recursive C Programs for 1. Searching an element in a given list of integers using the Binary searchmethod. 2. Solving the Towers of Hanoi problem.
5.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
6.	Create a Queue, perform different operations such as Insert, Delete and Display.
7.	Write a menu driven C Program to simulate the working of a Circular Queue ofintegers using an array. Provide the following operations: a. Insert b. Delete c. Display

8.	Write a menu driven C Program using dynamic variables and pointers, to construct a Singly linked list of integers and perform insertion and deletion operations.
9.	Implement Multiple stacks and queues and demonstrate different operations such as Insert, Delete and Display
10.	Write a menu driven C Program 1. To construct a binary search tree of integers. 2. To traverse the tree using all the methods i.e., In-order, Pre-order and Post-order.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Conduct two tests, each worth 20 marks, and Combine them to make a total of 40 marks. Record writing 5 marks & continuous evaluation 5 marks	50
Total		**50**

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1		3												
CO2		3	2											
CO3		3											3	
CO4		3	2										3	

Course Title	Social Connect & Responsibility		
Course Code	23SCR	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE	100 Marks	Total Hours	20 hours

Course Objective: Provide a formal platform for students to communicate and connect withtheir surroundings and create a responsible connection with society.

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

#	Course Outcomes	Mapping to PO's
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	3,5,6
2	Communicate and connect with their surroundings.	7,12

MODULE – 1

Plantation and adoption of a tree: Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.

MODULE – 2

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.

MODULE -3

Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.

MODULE -4

Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. **Food Walk** City's culinary practices, food lore, and indigenous materials of the region used in cooking.

Course Conduction

A total of 15-20 hours engagement per semester is required for the course. Students will bedivided into teams and each team will be handled by two **faculty mentors**. Faculty mentors will design the activities for evaluation.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE)

After completion of, the social connect, 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 report should be signed by the mentor. The report shall be evaluatedon the basis of the following criteria and/or other relevant criteria pertainingto the activity completed.

- Dairy recording the details of activity conducted
- 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

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	2	3	-	-	-	-	-	-		
CO2	-	-	-	-	-	-	3	-	-	-	-	3		

Course Title	NSS,YOGA,PE		
Course Code	23NYP1	(L-T-P)C	(0-0-2) A
Exam	-	Hours/Week	2 Hrs
SEE	-	Total Hours	28

Course Objective: Importance of Sports & Yoga in day-to-day life

• National Service Scheme (NSS) will enable the students to: Understand the community in which they work identify the needs and problems of the community and involve them in problem-solving

Course outcomes: the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	The importance of fitness/sports in day-to-day life	9,12	
2	Benefits of Yoga on fitness and health	9,12	
3	Understand the importance of his/her responsibility towards the society.	6	
4	Analyze the environmental and societal problems/issues and will be able to design solutions for the same	6	

Course Contents:

SPORTS and ATHLETICS:

Athletics Track- 110 & 400 Mtrs 110 Mtrs and 400Mtrs:

Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles Crouch start (its variations) use of Starting Block. Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing Hurdles

Jumps- High Jump Approach Run, Take-off, Bar Clearance (Straddle), and Landing Throws- Discuss Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).

YOGA:

Introduction of Yoga, Aim, and Objectives of Yoga, Prayer, Yoga, its origin, history, and development.

1)Yoga, its meaning, definitions.

2) Brief introduction of yogic practices for the common man- Yogic practices for the common man to promote positive health

3) Rules and regulations

4) Misconceptions of Yoga

5) Suryanamaskara

6) Different types of Asanas

a. Sitting- 1. Padmasana, 2. Vajrasana

b. Standing- 1. Vrikshana, 2. 2. Trikonasana

c. Prone line-1. Bhujangasana 2. Shalabh asana d. Supine line- Utthita dvipadasana, 2. Ardha halasana

NSS:

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 to social and economic issues.

4. Water conservation techniques – Role of different stakeholders– Implementation.

5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.

6. Helping local schools to achieve good results and enhance their enrolment in Higher/ Technical/ vocational education.

7. Developing a Sustainable Water management system for rural areas and implementation approaches.

8. Contribution to any national-level initiative of the 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 connections and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

References:

- Dharma, P.N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi
- Swami Kuvulyananda : Asma (Kavalyadhama, Lonavala) • Tiwari, O P : Asana Why and How
- Ajitkumar : Yoga Pravesha (Kannada)
- Swami Satyananda Saraswati : Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
- Swami Satyananda Saraswati : Surya Namaskar,(Bihar School of Yoga, Munger)
- Nagendra H R : The art and science of Pranayama
- NSS Course Manual, Published by NSS Cell, VTU Belagavi

Course Title	Bridge Course for Diploma Students BRIDGE COURSE MATHEMATICS - I (Common to all Branches of Engineering) (Audit Course)		
Course Code	**23BCM301**	**L-T-P**	**(3-0-0)**
Exam	**3 Hrs.**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**42**

Course Objective: Students will be able to use appropriate data structures for solving problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Solve simple problems on determinants, matrix multiplication, partial differentiation, and integration.	1	-
2.	Compute the roots of transcendental equations and interpolate when the experimental data is given.	1	-
3.	Expand the given function in terms of Taylor/ Macluarin's series.	1	-

MODULE – 1	**10Hrs.**

Basic Formulas: Partial fractions. Matrices and determinants: matrix multiplication, evaluation of determinants, finding inverse.

Differentiation-I: Review of limit and Continuity, differentiation- Basic formulas, Sum rule, product rule, quotient rule, chain rule and problems.

Differentiation-II: Taylor's series, and Macluarin's series of simple functions for single variable, simple problems.

MODULE – 2	**10 Hrs.**

Partial Differentiation: Definition, Illustrative examples on Partial differentiation, Total differentiation, chain rule, Differentiation of composite and implicit functions, Jacobians, illustrative examples and problems, simple problems.

MODULE -3	**10 Hrs.**

Integration: Basic formulas, Illustrative examples, evaluation of definite integrals, Integration by parts, Bernoulli's rule of Integration.

Integral calculus: Reduction formula for functions $sin^n x$, $cos^n x$(without proof), Simple problems, Double & triple integration, simple problems with standard limits.

MODULE -4	**12 Hrs.**

Numerical Methods - Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method.

Numerical Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula, central difference formulas-Bessel and Stirling formulas, illustrative examples.

Practical Component:

NIL

Note –1. Theorems and properties without proof. Applicable to all the modules.

2. Self study part is not included for Semester End Examination.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40th edition (2007).
2. Erwin Kreyszig, Advanced Engineering Mathematics, Tata McGraw Hill, Publications, 8th edition (2007).

Reference Books:

1. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010..

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**1**													
CO2	**1**													
CO3	**1**													

Course Title	Mathematics for Information Science Engineering-II		
Course Code	23MAIS401	L-T-P	(3-1-2) 4
Exam	3 Hrs.	Hours/Week	6
SEE	50 Marks	Total Hours	65(40L+13T+12P)

Course Objective: Students will be able to use appropriate data structures for solving problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Correlate the experimental data using correlation coefficient. Predict the output corresponding to input using regression, fit a curve to the data, solve simple problems on probability and joint probability.	1	-
2.	Validate an assumption through "hypothesis testing" (that is the assumption is not simply because of chance).	1,2	-
3.	Analyze the problems connected with probability to apply suitable probability distribution and also, predict the probability in the long run for Markov chain-based problems.	1,2	-
4.	Write the R-programme for the mathematical procedures connected with probability and statistics and model real-life problems/engineering application problems and solve the same.	1,2,5	-

MODULE – 1	10 Hrs.

Statistics: Correlation, Karl Pearson coefficient of correlation and Spearman's rank correlation coefficient. Physical interpretation of numerical value of the rank correlation coefficient. Linear Regression analysis (when the experimental output depends on one input). Illustrative examples from engineering field, multiple linear regression analysis (When the experimental output depends on two inputs). Curve fitting-exponential.

Self-study: Illustrative examples. Curve fitting-linear, quadratic.

MODULE – 2	10 Hrs.

Brief introduction: Random variable

Continuous Random Variables: Definition of PDF and CDF, Expectation and Variance, illustrative examples.

Probability distribution: Exponential pdf, Normal/Gaussian pdf. Discussion on the choice of PDF. Illustrative examples from engineering field.

Application: Current measurement problems and Digital transmission channel connected with pdf.

Self-study: Uniform pdf. Detection of signal connected with pdf.

MODULE -3	10 Hrs.

Confidence intervals & Hypothesis analysis: Introduction, Testing a hypothesis, central limit theorem-statement, Level of significance, Simple sampling of attributes, confidence intervals, Test of significance for large samples, Comparison of large samples, Student's t-distribution, Chi-square distribution.

Application: Propellant burning rate, process-capacity problem.
Self-study: drying time problem, Two catalyst effect on chemical reaction.

MODULE -4	10 Hrs.

Joint Probability Distribution & Stochastic Processes: Concept of joint probability, Joint distributions of discrete random variables, Independent random variables-problems. Joint expectation, co-variance, and correlation.

Markov Chains: Introduction, stochastic matrices, fixed probability vectors and regular stochastic matrices.

Application: Application of Markov chain to determine the voting tendencies.

Self-study: Estimating the population distribution of a city due to migration.

Tutorial:

1. A report on the need of studying Correlation & Linear Regression.
2. Examples on Correlation & Linear Regression.
3. A report on the need of studying Multiple Regression.
4. Examples on Multiple Regression.
5. Examples on Continuous Random Variable.
6. Examples on Normal probability distribution & exponential probability distribution.
7. Discussion on the applications connected with Normal probability distribution.
8. Discussion on the applications connected with Exponential probability distribution.
9. Examples on Hypothesis testing such as student-t test, Chi-square.
10. Examples on Joint probability distribution.
11. Application of Joint probability distribution in engineering.
12. Examples on Markov chain.
13. Application of Markov chain in engineering.

Practical Component:

1. Examining the correlation of the experimental data.
2. Carryout linear regression and multiple regression analysis for the experimental data.
3. To predict the probability of continuous random variable in an interval (Uniform random variable, exponential variable).
4. To predict the probability of continuous random variable in an interval (Normal random variable).
5. Hypothesis testing on application problem connected with mean, variance, proportions when sample size is large.
6. Hypothesis testing on application problem connected with mean, variance, proportions when sample size is less (student's T distribution, chi square distribution)
7. To predict the probability of application connected with Markov process in long run.
8. Estimating the population distribution of a city due to migration.

Activity:

1. Negative binomial distribution: Failure of server's problems,
2. Poisson distribution: Contamination problem, flaws in wires.
3. Exponential distribution: lack of memory property.

4. Continuous random variable: Shaft conforms.
5. Continuous random variable: detection of signal, Digital transmission channel.
6. Hypothesis analysis Depression treatment.
7. Hypothesis analysis defect in printed circuit board.
8. Confidence levels: Doping the cement with lead effect on percentage of calcium.
9. Current measurement problems, Propellant burning rate, process-capacity problem, drying time problem, two catalyst effect on chemical reaction.
10. Application of Markov chain in estimating the population distribution of a city due to migration.

Note –1. Theorems and properties without proof. Applicable to all the modules.

2. Self study part is not included for Semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44thEdition	Khanna Publications	2016.
2	Advanced Engineering Mathematics	Erwin Kreyszig	9th edition	Wiley India Pvt. Ltd	2014
3	Higher Engineering Mathematics	B V Ramana	2nd edition	Tata McGraw Hill Publications	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Probability and Random Process with application to Signal Processing	Scott L.Miller, Donald G. Childers	2nd Edition	Elsevier Academic Press	2013
2	Statistics for engineers and Scientists	William Navide	3rd edition	Mc-Graw hill education, India pvt. Ltd.	2014

3	Probability, Statistics and Random Process	T.Veerarajan	3rd edition	Tata McGraw Hill Co.	2008
4	Theory and problems of probability	Seymour Lipschutz and marclarslipson	2nd edition	Schaum out line series	2008

MOOC Course:

SN	Course Name	Course offered by	Year	URL
1	Probability, Statistics and Random Process	nptel	2023	http://nptel.ac.in/courses.phd?disciplineID=111

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3	2												
CO3	3	2												
CO4	3	2			1									

Course Title	Microprocessor and Microcontroller		
Course Code	23IS402	(L-T-P)C	(3-0-2)4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: To get acquainted with the importance and applications of Microprocessor and Microcontroller.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the complete architecture of the 8086 processor and the Segmented memory management.	1	-
2	Develop the assembly language programs for the given problems.	3	-
3	Describe the architectural features and instructions of ARM microcontroller	2	-
4	Interface external devices and I/O with ARM microcontroller.	3	-

MODULE – 1	09 Hrs.

The 8086/8088 Processors: Register Organization of 8086, Architecture, Signal descriptions of 8086, Physical memory organization, General bus operation, I/O Addressing capability, Special processor activities, 8086 Machine language Instruction formats, addressing modes of 8086, Instruction set of 8086/8088.GPU: Introduction to GPU, Streaming multiprocessors, cache hirarchy, graphics pipeline.

MODULE – 2	09 Hrs.

8086/8088 Instruction Set & Assembler Directives: Assembler Directives and Operators. Instruction Set. The art of Assembly Language Programming with 8086/8088: A few machine level programs, Machine coding the programs.

MODULE -3	09 Hrs.

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 -4	09 Hrs.

Introduction to the ARM Instruction Set: Data Processing Instructions, Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants. **ARM programming using Assembly language:** Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced Microprocessors and Peripherals	Ajoy Kumar Ray &Kishor M Bhurchandi,	3rd	McGraw Hill publication	2018
2.	ARM system developer's guide,	Andrew N Sloss, Dominic Symes and Chris Wright,	3rd	Kaufman publishers	2008

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Microprocessors and Interfacing Programming and Hardware	Douglas V. Hall,	2nd	McGraw Hill publication	2018
2	Microcontroller (ARM) and Embedded System	Raghunandan G.H	2nd	Cengage learning Publication	2019
3.	The Insider's Guide to the ARM7 Based Microcontrollers, Ltd	Trevor Martin	1st	Hitex Publication	2005

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced Microprocessors and Peripherals.	Ajoy Kumar Ray &Kishor M Bhurchandi,	3rd	McGraw Hill publication	2018

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Microprocessors and Interfacing	By Prof. Shaik Rafi Ahamed IIT Guwahati	2022	https://onlinecourses.nptel.ac.in/noc22_ee09/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Laboratory Conduction	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
PART A Conduct the following 8086 Microprocessor experiments by writing program using MASM.	
1	Write a program to find factorial of a number.
2	Performing binary search on given 'n' 8 - bit and 16 - bit numbers.
3	Reversing a given string and check whether it is a palindrome or not.
4	Generating and print the first n Fibonacci numbers.
5	Performing the bubble sort on given n 8-bit numbers.
6	Finding out whether given sub string is present or not in main string of characters.
7	Computing Binomial coefficient using recursive procedure; assume n and r are non-negative integers.
8	Developing macros, to read a character from the key board in a module and to display a character from the module.
PART –B Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.	
1	Display “Hello World” message using Internal UART.
2	Interface and Control a DC Motor.
3	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
4	Determine Digital output for a given Analog input using Internal ADC of ARM controller.
5	Interface a DAC and generate Triangular and Square waveforms.
6	Interface a 4x4 keyboard and display the key code on an LCD.
7	Demonstrate the use of an external interrupt to toggle an LED On/Off.
8	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3													
CO2			2											
CO3		2												
CO4			3											

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	23IS403	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: Students will acquire the concepts of database, and application of SQL for solving problem.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the concepts of Database Management Systems and its applications.	1	-
2.	Design ER diagram for real world applications and develop SQL queries.	3	2
3.	Apply normalizations for relation scheme.	2	-
4.	Describe the issues in transaction management.	1	-

MODULE-1 **9 Hrs.**

Introduction: Introduction, an example, Characteristics of Database approach, Actors on the Screen, Workers Behind the Scene, Advantages of Using DBMS Approach. Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.

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, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues.

MODULE-2 **9 Hrs.**

Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping.

SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL.

MODULE-3	9 Hrs.
SQL(contd.): More Complex SQL Queries, Insert Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Schema Change Statements in SQL. **Database Design:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.	
MODULE-4	**9 Hrs**
Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock - Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery. Crash Recovery: Introduction to ARIES **NoSQL**: An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types, Advantages and Drawbacks of NoSQL. Overview of MongoDB- what is MongoDB?,MongoDB Architecture, DBcollection and document structures, BSON format, CRUD operations.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition	Addison-Wesley	2015
2	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd Edition	McGrawHill	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Database System Concepts	Silberschatz, Korth and Sudarshan	6th	Mc-Graw Hill	2010
2	Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	8th	Pearson Education	2006

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Database Systems	Elmasri and Navathe	7th	Addison-Wesley	2015

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Database Management Systems	NPTEL	2022	https://nptel.ac.in/courses/106105175
2	MongoDB	Tutorialspoint	2024	https://www.tutorialspoint.com/mongodb/mongodb_overview.html

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Database lab program execution	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1.	Consider the following schema: EMPLOYEE (Ename, Ssn, Bdate, Sex, Address, salary, Mgrssn, Dno) DEPARTMENT (Dname, Dnumber, Mgrssn, Mgr_start_date) PROJECT (Pname, Pnumber, Plocation, Dnum) WORKS_ON (Essn, Pno, Hours) DEPENDENT(Essn, Dependent_name,Sex) Create above tables by specifying primary key, foreign key and other suitable constraints. Insert atleast 5 tuples to each created table. i.Retrieve the name and address of all employees who work for the "ISE" department. ii. For each employee, retrieve the employee's name and the name of his or her immediate supervisor iii. Find the sum of all salaries of all employees iv. For each department, retrieve the department number, the number of employees in the department and their average salary
2.	Consider the following relation schema: SAILORS (Sid: integer, Sname: string, Rating: integer, Age: real) BOATS (Bid: integer, Bname: string, Color: string) RESERVES (sid: integer, Bid: integer, Day:date) Create above tables by specifying primary key, foreign key and other suitable constraints. Insert atleast 5 tuples to each created table. Design a database to the satisfy the above requirements and answer following queries i. Find all sailors with a rating above 7 ii.Find the names of sailors who have reserved boat number 103 iii. Find the names of sailors who have reserved a red boat iv. Find the names of sailors who have reserved a red or a green boat 3.

3	Consider the following relation schema: STUDENT (Snum: integer, Sname: string, Major: string, Level: string, Age: integer) CLASS (Cname: string, Meets at: string, Room: string, Fid: integer) ENROLLED (Snum: integer, Cname: string) FACULTY (Fid: integer, Fname: string, Deptid: integer) The meaning of these relations is straightforward; for example, enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc) Write the following queries in SQL. No duplicates should be printed in any of the answers. i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled. iii. Find the names of all students who are enrolled in two classes that meet at the same time. iv. Find the names of faculty members who teach in every room in which some class is taught.
4	. Consider the relation schema for book dealer database: AUTHOR (Author-id:int, Name:string, City:string, Country:string) PUBLISHER (Publisher-id:int, Name:string, City:string, Country:string) CATALOG (Book-id:int, Title:string, Author-id:int, Publisher-id:int, Category-id:int, Year:int, Price:int) CATEGORY (Category-id:int, Description:string) ORDER-DETAILS (Order-no:int, Book-id:int, Quantity:int) Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation. i. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000. ii. Find the author of the book which has maximum sales. iii. Demonstrate how you increase the price of books published by a specific publisher by 10% iv. List any department that has all its adopted books published by a specific publisher

5	Consider the schema for Movie Database: ACTOR (Act_id, Act_Name,Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST (Act_id, Mov_id, Role) RATING (Mov_id, Rev_Stars) Write SQL queries to Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation. 1. List the titles of all movies directed by 'Hitchcock'. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015. 4. Update rating of all movies directed by 'Steven Spielberg' to 5.
6	Consider the following database for a banking enterprise BRANCH (branch-name: String, branch-city: String, assets: real) CUSTOMER(customer_name:String,customer_street: String,customer_city:String) ACCOUNTS (accno: int, branch-name: String, balance: real) DEPOSITOR (customer-name: String, customer-street: String, customer-city: String) LOAN (loan-number: int, branch-name: String, amount: real) BORROWER (customer-name: String, loan-number: int) Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation. 1. Find all the customers who have at least two accounts at the Main branch. 2. Find all the customers who have an account at all the branches located in a specific city. Demonstrate how you delete all account tuples at every branch located in a specific city.

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**O7**	**O8**	**O9**	**O10**	**O11**	**O12**	**SO1**	**SO2**
CO1	3													
CO2			3											2
CO3		3												
CO4	3													

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	**23IS404**	**(L-T-P)C**	**(3-0-0)3**
Exam	**3hrs**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Students will be able to design algorithms using various strategies and analyze it mathematically.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply various algorithm design techniques to solve the given problem.	3	1
2.	Analyze the time complexity of the algorithm using asymptotic notations.	2	1
3.	Differentiate tractable & intractable problems & apply techniques that help to cope up with limitation of algorithm power.	3	1
4.	Conduct experiments to implement the designed algorithms	3	1

MODULE 1	**10 Hrs.**

Introduction: Notion of Algorithm, Fundamentals of algorithmic problem solving. **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis framework, Asymptotic notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive search.

MODULE 2	**10 Hrs.**

Divide-and-Conquer: Binary Search, Merge Sort, Quick Sort, Binary tree traversals and related properties, Multiplication of large integers, Strassen's Matrix multiplication. **Decrease-and-Conquer:** Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for generating combinatorial objects.

MODULE 3	**10 Hrs.**

Transform-and-Conquer: Pre-sorting, Balanced Search Trees, Heaps and Heap Sort, Problem reduction. **Space and Time Trade-off**: Sorting by counting, Input enhancement in string Matching (only Horspool), Hashing. **Dynamic Programming**: Computing a Binomial coefficient, Warshall's Algorithm, Floyd's algorithms, The Knapsack problem.

MODULE -4	10 Hrs.
Greedy Technique: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees, **Limitations of Algorithm Power:** Lower-bound arguments, Decision trees, P, NP and NP-Complete Problems, coping with the Limitations of Algorithm Power: Backtracking, Branch-and-bound.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to the Design and Analysis of Algorithms	Anany Levitin	3rd Edition	Pearson Education	2017.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Algorithms	Thomas H. Coremen, Charles E. Leiserson, Ronald L. Rivest	4rd Edition	PHI	2022
2	Computer Algorithms	Horowitz E., Sahani S., Rajasekharan S	2nd Edition	Galgotia Publications	2018

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	3rd Edition	Pearson Education	2017.

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	1. Design and Analysis of Algorithms	nptel	2022	https://nptel.ac.in/courses/106/106/106106131/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity: On different algorithm technique with real world examples.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**O2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1			3										3	
CO2		3											3	
CO3			3										3	
CO4			3										3	

Course Title	C# AND .NET TECHNOLOGIES		
Course Code	23IS405A	(L-T-P)C	(2-0-2) 3
Exam	3 Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	26L + 14P

Course Objective: Students will be able to apply Object Oriented Programming concepts for designing Applications using language C# and IDE – Visual Studio.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop C# programs using Visual Studio IDE.	1,2	-
2	Apply Object Oriented Programming concepts in C# programming language	1,2	-
3	Interpret Interfaces and define custom interfaces for application.	1,2	-
4	Analyse a C# program for identifying bugs.	2	-

MODULE – 1	7Hrs.

Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, working with variables, operators, and expressions, writing methods, and applying scope, using decision statements, using compound assignment and iteration statements, Managing errors and exceptions.

MODULE – 2	7Hrs.

Understanding the C# object model: Creating and Managing classes and objects, understanding values and references, creating value types with enumerations and structures, Using arrays.

MODULE -3	6Hrs.

Understanding parameter arrays, working with inheritance, creating interfaces and defining abstract classes, Using garbage collection and resource management.

MODULE -4	6Hrs.

Defining Extensible Types with C#: Implementing properties to access fields, introducing generics, Using collections,Operator overloading.

Practical Component/Tutorial:

1. Write a C# program that calculates the area of a rectangle. The program should ask the user to enter the length and width of the rectangle as inputs. Then, using appropriate variables, operators, and expressions, calculate and display the area of the rectangle.
2. Program that converts a temperature from Celsius to Fahrenheit. The program should have a method called Convert To Celsius that takes a temperature in Celsius as a parameter and returns the corresponding temperature in Fahrenheit. Use appropriate variable types and apply appropriate scope in your program.
3. Write a C# program that calculates the average of a series of numbers entered by the user. The program should ask the user to enter the numbers one by one, and use a loop to accumulate the sum of the numbers. If the user enters a non- numeric value, the program should handle the exception gracefully and continue asking for valid input. Once the user is done entering numbers, calculate and display the average.
4. Create a class called "Car" that represents a car object. The Car class should have properties such as "Make", "Model", and "Year" to store the car's make, model, and manufacturing year respectively. Implement a method called "StartEngine" that prints a message indicating that the car's engine has started. In the Main method, create an instance of the Car class, set its properties, and call the StartEngine method to demonstrate the usage of classes and objects.
5. Create an enumeration called "DaysOfWeek" that represents the days of the week (e.g., Monday, Tuesday, etc.). Then,create a structure called "Appointment" that has properties such as "MeetingName" (string), "Day" (DaysOfWeek), and "Time" (DateTime). In the Main method, create an array of Appointment objects and populate it with different appointments. Display the details of each appointment using a loop.
6. Write a program that takes a variable number of integers as input using a parameter array. The program should calculate and display the sum of all the integers entered by the user.
7. Create a base class called "Shape" that has an abstract method called "CalculateArea" and a virtual method called "DisplayInfo". Create two derived classes called "Rectangle" and "Circle" that inherit from the Shape class. Implement the CalculateArea method in both derived classes to calculate the area of a rectangle and a circle respectively. Implement the DisplayInfo method in each derived class to display information about the shape. Finally, create instances of the Rectangle and Circle classes, call the CalculateArea and DisplayInfo methods on them to demonstrate inheritance and polymorphism.
8. Create a class called "Person" that has private fields for name and age. Implement properties to access and modify these fields. The Name property should be read-only, while the Age property should be read-write. In the Main method, create an instance of the Person class, set the name and age properties, and display the person's details.
9. Create a generic class called "Stack<T>" that represents a stack data structure. The class should have methods to push an item onto the stack, pop an item from the stack, and check if the stack is empty. In the Main method, create two instances of the Stack class, one for storing integers and another for storing strings. Push some items onto both stacks and perform pop operations to

demonstrate the generic behaviour of the class.

10. Create a class called "Complex" that represents a complex number. Implement operator overloading for addition, subtraction, and multiplication of complex numbers. Test the operator overloading by performing arithmetic operations on instances of the Complex class.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Microsoft Visual C# Step by Step	John Sharp	8th Edition	PHI Learning Pvt. Ltd	2016

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Inside C#	Tom Archer, Andrew Whitechapel	2nd	WP Publishers	2012
2	The Complete Reference C# 3.0	Herbert Schildt	3rd	Tata McGraw Hill Education Private Limited	2007

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	C#	coursera	2020	https://www.coursera.org/learn/intro-to-dotnet-core

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**3**												
CO2	**2**	**2**												
CO3	**2**	**2**												
CO4		**2**												

Course Title	Internet of things		
Course Code	23IS405B	(L-T-P)C	(2-0-2)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40(28+12P)

Course Objective: Students will be able to develop IOT applications.

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamentals and applications of IoT, its Architecture, Design Principles and Standards	1	-
2.	Apply programming skills to design IoT applications	3	-
3.	Appraise the role of IoT protocols for efficient network communication.	2	2
4.	Design and Implement applications of IoT and make presentation in team	5, 10	2

MODULE-1	7 Hrs

Introduction to Internet of Things: Definition and characteristics of IoT, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design, IoT functional blocks, IoT communication Models, IoT communication API's, IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems.IoT levels and deployment template Domain specific IoTs, - IoT levels, Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health &Lifestyle.

MODULE-2	7 Hrs

IoT and M2M IoT System management with NETCONF-YANG Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPE IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring,

MODULE-3	7 Hrs

IoT Physical Devices and End points - What is an IoT device; Exemplary Device- Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices. IoT Physical Servers & Cloud Offerings: Amazon Web Services for IoT, AmazonEC2, AmazonS3, Amazon RDS.

MODULE-4	**7 Hrs**
Case studies illustrating IoT Design: Introduction to IOT Design, Home Automation, Smart Lighting, Home Intrusion Detection, Cities, Smart Parking. Data Analytics for IOT- Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things - A Hands on Approach	Arshdeep Bahga and Vijay Madisetti	1st	Universities Press	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	The Internet of Things: Key Applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi,	2nd	Wiley	2012
2	Internet of Things: A Hands-On Approach Vijay Madisetti	Vijay Madisetti, ArshdeepBahga	1st	Orient Blackswan	2014

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Design for Internet of things	IISC Bangalore	2017	https://nptel.ac.in/courses/108/108/108108098/

E-Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things - A Hands on Approach	Arshdeep Bahga and Vijay Madisetti	1st	Universities Press	2015

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30

AAT	Lab Conduction	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Study the fundamental of IOT software and components.
2	Familiarization with Ardunio / raspberry Pi and perform necessary software.
3	To interface LED / Buzzer with Ardunio / raspberry Pi and write a program to turn on LED for one seconds after every two seconds.
4	To interface push button Digital sensor(IR/LDR)with Ardunio / raspberry Pi and write a program to turn on LED when push button is pressed or at sensor detection.
5	To interface DHT level sensor with Ardunio / raspberry Pi and write a program to print temperature and humidity readings.
6	To interface motor using relay with Ardunio / raspberry Pi and write a program to turn on motor when push button is pressed.
7	To interface Bluetooth with Ardunio / raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
8	write a program on Ardunio / raspberry Pi to upload temperature and humidity data to thinkspeak cloud.

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3													
CO2			2											
CO3		2												3
CO4					3					3				3

Course Title	OPTIMIZATION TECHNIQUES		
Course Code	23IS405C	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40

Course Objective: Solve optimization problems using various methods

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-

Course Contents:

MODULE – 1	10 Hrs

Introduction : Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation**Linear Programming – 1 :** Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples

MODULE – 2	10 Hrs

Simplex Method - 1 : The Essence of the Simplex Method; Setting up the Simplex Method; The **Algebra** of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method **Simplex Method – 2 :** Adapting to other Model Forms; Post Optimality Analysis, Computer implementation.

MODULE – 3	10 Hrs

Revised Simplex Methods : Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight**Duality Theory:** The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual **Relationships**, Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ;

Parametric linear programming; The upper bound technique.

MODULE – 4	10 Hrs

Transportation Model : Definition of the Transportation Model, Nontraditional Transportation Models, The TransportationAlgorithm. **Assignment Model and Network Models :** The Assignment Model, CPM and PERT

Text Books :

1. Frederick S. Hillier and Gerald J. Lieberman, "Introduction to Operations Research", Tata McGrawHill, 9th Edition, 2012. (Chapters: 1.1 to 1.3, 2, 3.1 to 3.3, 4.1 to 4.7, 5, 6.1 to 6.7, 7.1)
2. Hamdy A Taha, "Operations Research: An Introduction", Prentice Hall India, 8th Edition, 2005.(Chapters: 5, 6.4)

Reference Book:

1. Wayne L. Winston, "Operations Research Applications and Algorithms", Thomson Course Technology, 4th Edition 2003

Course Articulation Matrix

Course Outcome	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2		3												
CO3	3	2												
CO4					2									

Course Title	PROBABILTIY, STASTISTICS AND QUEING		
Course Code	23IS405D	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3 Hrs
SEE	50 Marks	Total Hours	40

Course Objective: To study the basics of statistics, measure central tendency and dispersion.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the basics of probability, sample space, events, statistics and apply them to real life problems	1	-
2.	Distinguish probability density and distribution functions for single and multiple random variables.	1	-
3.	Use the probability, moment generating functions and characteristic functions.	1	-
4.	Formulate, analyze and validate models applicable to practical problems.	2	-

MODULE – 1	10 Hrs.

Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes theorem of inverse probability, Properties of probabilities with proofs, Examples.

MODULE – 2	10 Hrs.

Random Variable and Mathematical Expectation: Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions,

Properties of expectation and variance with proofs, Examples.

MODULE -3	10 Hrs.

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearmans rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient,

Properties of Spearmans rank correlation coefficient, Probable errors, Examples.

MODULE -4	**10 Hrs.**

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression

coefficient, Properties of regression coefficient, Examples.

Text Books:

1. S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
2. G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and co.

Reference Books:

1. Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction To Probability And Statistics, 3rd Edition, Wiley
   Publication.

Course Articulation Matrix

CO	**Program Outcomes [POs]**													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3	3													
CO4		2												

Course Title	Green IT and Sustainability		
Course Code	23IS406A	L-T-P	(2-0-0)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	20

Course Objective: Students will be able to use appropriate data structures for solving problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe the concepts of how to manage the green IT with necessary components.	1	-
2.	Select hardware and software to facilitate more sustainable operation	2	-
3.	Relate the green computing practices to save energy	2,6,7	-
4.	Describe the use of IT in relation to environmental perspectives.	2,6,7	-

MODULE – 1	5 Hrs.

Green IT: **An Overview**Green IT fundamentals - Environmental Impacts of IT - Green IT standards - Applying IT for enhancing environmental sustainability

MODULE – 2	5 Hrs.

Green Devices And Hardware Life cycle of a device or hardware - Reuse, Recycle and dispose. Green software - Energy saving software techniques,Green information systems, evaluating software impact to platform power.

MODULE -3	5 Hrs.

Managing Green IT Implementation of Green IT, Information Assurance and communication - Green Enterprise transformation roadmap -Green compliance.

MODULE -4	5 Hrs.

Law, Standards and Protocols Regulatory environment and IT manufacturers, Non regulatory government initiatives, Green building standards, Green data centers.

Text Books:

1. Bhuvan Unhelkar, —"Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2014

Reference Books:

1. Woody Leonhard, Katherine Murray, —Green Home computing for dummies, August 2012.
2. San Murugesan, G.R. Gangadharan"Harnessing Green IT Principles and Practices",Wiley Publication, ISBN:9788126539680.

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2		2												
CO3		2				2	2							
CO4		2				2	2							

Course Title	UI/UX LABORATORY		
Course Code	23IS406B	(L-T-P)C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28

Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centered design, usability, and user experience.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mappingto PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	3	-
2.	Develop wire frames and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	3,5	-

Course Contents:

1	Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience.
2	Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes.
3	Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions.
4	Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience.
5	Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase.
6	Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labeling, and input validation to enhance user comprehension and completion rates.
7	Enhancing Mobile App Onboarding: Design an onboarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them

	through thesetup process in a clear and engaging manner.
8	Redesigning a Checkout Process: Redesign the checkout process for an e-commerce website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience.
9	Designing an Error Page: Design a visually appealing and helpful error page for a website. Consider the tone of the message, provide relevant information or suggestions, and include navigational elements to guide users back on track.
10	Creating an Interactive Prototype: Use a prototyping tool to create an interactive prototype for a mobile app or website. Design key screens and transitions to showcase the user flow and interactions within the interface.

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3												
CO2			3		3									
CO3														
CO4														

Course Title	INTRODUCTION TO WEB TECHNOLOGY		
Course Code	**23IS406C**	**L-T-P**	**(0-0-1)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**26**

Course Objectives: Initially Students will be taught the basic concepts about XHTML, Javascript, PHP, MYSQL and following programming exercises are carried out to understand the concepts.

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

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Understand the fundamentals of HTML, XHTML, Javascript, PHP and MYSQL	1	-
2.	Design programs using Javascript and PHP	2, 3	-
3.	Design and implement interactive Websites	3, 5	2

1. Develop and demonstrate a XHTML document that illustrates the use of external style sheet, ordered list, table, borders, padding, color, and the tag.
2. Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
3. Using Javascript script, develop a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
4. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
5. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-

time on the web page upon reopening of the same page.

6. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
7. Using PHP and MySQL, develop a program to accept book information viz. Accession Number, Title, Authors, Edition and Publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Text Books:

1. Robert W Sebesta. Programming the World wide web, 8th edition, Pearson Education

Reference Books:

1. Chris Bates. Web Programming building internet applications, 3rd edition, Wiley India
2. James Lee, Brent Ware. Open Source Web Development with LAMP, Pearson Education

Course Articulation Matrix

Corse Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**													
CO2		**2**	**2**											
CO3			**3**		**3**									**3**

Course Title	TECHNICAL WRITING USING LATEX		
Course Code	23IS406D	L-T-P	(0-0-1)1
Exam	3 Hrs	Hours/Week	2 Hrs
SEE	50 marks	Total Hours	28 Hrs

Course Objective: To introduce the basic syntax and semantics of the LaTeX scripting language

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Identify different types of technical documents for a given requirement.		-
2.	Create well-written short technical documents and typeset it in LaTex	1	-
3.	Create a simple report for a given technical topic, and typeset it in LaTex	1	-
4.	Create a sample research paper in a technical topic, and typset it in LaTex templates	2	-

MODULE – 1	7 Hrs.

Introduction: Introduction to LaTeX, its installation, and different IDEs. Creating the first document using LaTeX,organizing content into sections using article and book class of LaTeX.

MODULE – 2	7 Hrs.

Styling Pages: Reviewing different paper sizes, examining packages, formatting the page by setting margins,customizing header and footer, changing the page orientation, dividing the document into multiple columns, reading different types of error messages.

MODULE -3	7 Hrs.

Formatting Content: Formatting text (styles, size, alignment), adding colors to text and entire page, and adding bullets and numbered items, writing complex mathematics.

MODULE -4	7 Hrs.

Tables and Images: Creating basic tables, adding simple and dashed borders, merging rows and columns, and handling situations where a table exceeds the size of a page, adding an image, exploring different properties like rotate, scale.

Text Books:

1. Phillip A Laplante, "Technical Writing: A Practical Guide for Engineers and Scientists", 1st Edition, CRC Press, 2011.
2. Tobias Oetiker, "The Not So Short Introduction to LATEX" 2e https://cslab.pepperdine.edu/warford/cosc320/lshort.pdf [retreived 18 Oct. 22]

Course Articulation Matrix

CO	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1			3											
CO2					3									
CO3														
CO4										3				

Course Title	Biology for Engineers		
Course Code	23BEIS407	(L-T-P)C	(2-0-0)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

Course Objective: Realization of relation between Natural Engineering and man-made Engineering.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To familiarize engineering students with basic biological concepts	1	-
2	To involve students in an interdisciplinary vision of biology and engineering	2	-
3	To gain an appreciation for how biological systems can be designed and engineered to substitute natural system	2	-
4	To develop biological models using AI tools	3	-

MODULE – 1	6 Hrs.
Introduction to Human Anatomy: Overview of human anatomy, Structural organization of the human body- cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, muscular system and skeletal system.	
MODULE – 2	**8 Hrs.**
Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker,stents), Nervous system (Artificial neural network).	
MODULE -3	**8 Hrs.**
Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling. Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems. Dynamic Updating DNA Computing Algorithms. Beehive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.	
MODULE -4	**6 Hrs.**
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Publisher	Year
1	Bioinspired Engineering	Jenkins, C.H.	NY: Momentum press	2012
2	A Practical Guide to Bio-inspired Design,	Hashemi Farzaneh, Helena, Lindemann, Udo, Springer	Springer link	2019

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Bioinspired Engineering	Jenkins, C.H.	1st	NY:Momentum press	2012

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Two tests conducted for 20 marks each	40
AAT	Presentation on Biology Topics	10
Total		**50**

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Biology for Engineers	IIT Madras	2022	https://onlinecourses.nptel.ac.in/noc19_ge31/preview

Course Articulation Matrix														
Course Outcomes	**Program Outcomes [POs]**													
COS	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2		3												
CO3		3												
CO4			2											

Course Title	UNIVERSAL HUMAN VALUES		
Course Code	**23UHV**	**(L-T-P)C**	**(0-2-0)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**28 Hrs**

Course Objective:

The course aims at development of value education by the right understanding through the process of self-exploration (about themselves), family, society and nature/existence. Strengthening of self-reflection by development of commitment and courage to act are presented as the prime focus throughout the course towards qualitative transformation in the life of the student.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Start exploring themselves, get comfortable with each other and with the teacher and they start appreciating the need and relevance for the course. Also they are able to note that the natural acceptance (intention) is always for living in harmony.	PO6,PO7, PO8, PO9, PO12	-
2.	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.	PO6,PO7, PO8, PO9, PO12	-
3.	Present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.	PO6,PO7, PO8, PO9, PO12	-

MODULE-1	**8 Hrs.**

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

MODULE-2	**6 Hrs.**

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 Lecture, Understanding Harmony in the Self Tutorial, Harmony of the Self with the Body to ensure self-regulation and Health.

MODULE-3	**8 Hrs.**

Harmony in the Family, Nature and Existence: Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order.Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
MODULE-4 **6 Hrs**
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.
Self-Learning Activities- 1. Sharing about One self and Exploring Natural Acceptance 2. Exploring Harmony of Self with the Body 3. Exploring the Feeling of Respect 4. Exploring the Four Orders of Nature Lecture and Exploring Co-existence in Existence.. 5. Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	The Teacher's for a Foundation Course in Human Values and Professional Ethics.	R R Gaur, R Asthana, G P Bagaria	3rd, Revised	Excel Books, New Delhi	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Jeevan Vidya: Ek Parichaya	A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,	1st	Ajab Distributors	2017
2	HumanValues	A.N.Tripathi	5th	New Age Intl. Publishers New Delhi	2002
3	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	1st	Fingerprint! Publishing	2009
4	Small is Beautiful	E.F Schumacher	1st	VINTAGE	2010
5	Slow is Beautiful	Cecile Andrews	1st	New Society Publishers	2006

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	A foundation course in HUMAN VALUES and professional ethics	R R GAUR R SANGAL G P BAGARIA	1st edition	Anurag Jain for Excel Books	2009

MOOC Course:

SN	Course Name	Course offered by	Year	URL
1	Exploring Human Values: Visions of Happiness and Perfect Society	Prof. A.K. Sharma IIT Kanpur	2017	https://nptel.ac.in/courses/109104068

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Two tests conducted for 20 marks each	40
AAT	Presentation on UHV topic	10
Total		**50**

Course Articulation Matrix

Course Out comes	Program Outcomes [POs]												
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1						2	1	3	2			1		
CO2						2	1	3	2			1		
CO3						2	1	3	2			1		

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS LABARATORY		
Course Code	23IS408	L-T-P-C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
Students will be able to design algorithms using various strategies and analyze it mathematically.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Design algorithms using appropriate design techniques	3	1
2	Implement a variety of algorithms such assorting, graph related, combinatorial etc., in a high level language.	5	1
3	Analyze and compare the performance of algorithms using language features.	2	1
4.	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.	3	1

Course Contents:

Guided Laboratory Experiments

1.	Employees in an organization need to be grouped for a tournament based on their ages. Sort the ages using Merge sort and find the time required to perform the sorting.
2.	Students in a department need to be selected for a high jump competition based on their height (integer values only). Sort the heights of students using Quick sort and find the time required for the sorting.
3.	Print all the nodes reachable from a given starting node in agraph using Depth First Search method and Breadth First Search. Also check whether a graph is connected.
4.	Obtain the topological ordering of vertices in a given digraph.
5.	Implement Horspool algorithm for String Matching.
6.	Sort a given set of elements using the Heap sort method.
7.	Implement Floyd's algorithm and Warshall's algorithm for a given graph.

8.	There are n different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from the hostel using Prim's algorithm.
9.	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
10.	Implement 0/1 Knapsack problem using dynamic programming.
11.	Implement N Queen's problem using Backtracking.

Course Articulation Matrix														
Course Outcomes	**Program Outcomes [POs]**													
COS	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1			3										3	
CO2					3								3	
CO3		3											3	
CO4			3										3	

Course Title	NSS, YOGA,PE		
Course Code	23NYP2	L-T-P-C	(0-0-2) A
Exam	-----	Hours/Week	2Hrs
SEE	---	Total Hours	28

Course Objective: Understand the Meaning and Importance of the Fit India Movement, the Definition of fitness, Benefits of fitness, Types of fitness, and Fitness tips.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	The importance of fitness/sports in day-to-day life	3	1
2	Benefits of Yoga on fitness and health	5	1
3	Understand the importance of his/her responsibility towards the society.	2	1
4.	Analyze the environmental and societal problems/issues and will be able to design solutions for the same	3	1

Course Contents:

Guided Laboratory Experiments

SPORTS and ATHLETICS: Athletics Track- 110 &400 Mtrs 110 Mtrs and 400Mtrs: Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles Crouch start (its variations) use of Starting Block. Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing Hurdles Jumps- High Jump Approach Run, Take-off, Bar Clearance (Straddle), and Landing Throws- Discuss Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).

YOGA: Introduction of Yoga, Aim, and Objectives of Yoga, Prayer, Yoga, its origin, history, and development. 1)Yoga, its meaning, definitions. 2) Brief introduction of yogic practices for the common man- Yogic practices for the common man to promote positive health 3) Rules and regulations 4) Misconceptions of Yoga 5) Suryanamaskara 6) Different types of Asanas a. Sitting- 1. Padmasana, 2. Vajrasana b. Standing- 1. Vrikshana, 2. 2. Trikonasana c. Prone line-1. Bhujangasana 2. Shalabh asana d. Supine line- Utthita dvipadasana, 2. Ardha halasana

NSS: 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 to social and economic issues. 4. Water conservation techniques – Role of different stakeholders– Implementation. @#18102023 5. Preparing an actionable business proposal for enhancing the village income and approach for implementation. 6. Helping local schools to achieve good results and enhance their enrolment in Higher/ Technical/ vocational education. 7. Developing a Sustainable Water management system for rural areas and implementation

approaches. 8. Contribution to any national-level initiative of the 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 connections and responsibilities. 11. Plantation and adoption of plants. Know your plants. 12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs). 13. Govt. school Rejuvenation and helping them to achieve good infrastructure.