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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE New Delhi)

Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Computer Science and Engineering

III and IV Semester Scheme and Syllabus
2022 Scheme
Effective from the AY 2023-24

Approved in the BOS meeting held on 04/03/2025

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Vision and Mission of the Department

Vision:

To develop technical professionals acquainted with recent trends and technologies of computer science to serve as valuable resource for the nation/society.

Mission:

Facilitating and exposing the students to various learning opportunities through dedicated academic teaching, guidance and monitoring.

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Program Educational Objectives (PEOs)

PEO'S	
PEO1	Lead a successful career by designing, analyzing and solving various problems in the field of Computer Science & Engineering.
PEO2	Pursue higher studies for enduring edification.
PEO3	Exhibit professional and team building attitude along with effective communication.
PEO4	Identify and provide solutions for sustainable environmental development.

Program Specific Outcomes (PSOs)

PSO'S	
PSO-1	Analyze the problem and identify computing requirements appropriate to its solution.
PSO-2	Apply design and development principles in the construction of software systems of varying complexity.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2023– 24

Choice Based Credit System (CBCS)

UG PROGRAM: Department of Computer Science and Engineering **IV SEMESTER**

Sl. No	Course and Course Code		Course Title	Teaching Department (TD)and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC/BSC	BCS401	Analysis & Design of Algorithms	TD: CS PSB : CS	3	0	0		03	50	50	100	3
2	IPCC	BCS402	Microcontrollers	TD: CS PSB : CS	3	0	2		03	50	50	100	4
3	IPCC	BCS403	Database Management Systems	TD: CS PSB : CS	3	0	2		03	50	50	100	4
4	PCCL	BCSL404	Analysis & Design of Algorithms Lab	TD: CS PSB : CS	0	0	2		03	50	50	100	1
5	ESC	BCS405x	ESC/ETC/PLC	TD: CS/Maths PSB : CS/Maths	2	2	0		03	50	50	100	3
6	AEC/ SEC	BCS456x	Ability Enhancement Course/Skill Enhancement Course- IV	TD: Concerned department PSB:CS	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
7	BSC	BBOC407	Biology For Information Technology	TD / PSB: BT, CHE,	2	0	0		03	50	50	100	2
8	UHV	BUHK408	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	MC	BNSK459	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK459	Physical Education(PE)(Sportsand Athletics)	Physical Education Director									
		BYOK459	Yoga	Yoga Teacher									
		BMUK459	Music	Music Teacher									
		BNCK459	National Credit Corps (NCC)	NCC Coordinator									
			Total							**500**	**400**	**900**	**19**
Non-Credit Mandatory Course (NCMC)Prescribed to Lateral entry Diploma Students													
10	NCMC	BENGD1P2	English Communication Skill-II	HSS	0	0	0		02	**100**	---	**100**	**0**

The Lateral entry diploma students admitted to III semester are required to complete the English Communication skill -I in the III Semester and English Communication Skill -II in the IV Semester shall be considered for Vertical Progression as well as for the calculation of SGPA & CGPA ,But Completion of Course shall be mandatory for the award of degree.

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PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K :This letter in the course code indicates common to all the stream of engineering.

Ability Enhancement Course / Skill Enhancement Course – IV

BCS456A	Green IT and Sustainability	BCS456C	UI/UX (Lab)
BCS456B	Capacity Planning for IT	BCS456D	Technical writing using LATEX (Lab)

Engineering Science Course (ESC/ETC/PLC)

BCS405A	Discrete Mathematical Structures	BCS405C	Optimization Technique
BCS405B	Graph Theory	BCS405D	Linear Algebra

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried outbetween III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of degree.

IV SEMESTER SYLLABUS

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – IV

Analysis and Design of Algorithms (3:0:0) 3
(Effective from the academic year 2023 -24)

Course Code	BCS401	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

CLO1. Explain the methods of analyzing the algorithms and to analyze performance of Algorithms.

CLO2. State algorithm's efficiencies using asymptotic notations.

CLO3. Solve problems using algorithm design methods such as the brute force method, g greedy method, divide and conquer, decrease and conquer, transform and conquer, Dynamic programming, backtracking and branch and bound.

CLO4. Choose the appropriate data structure and algorithm design method for a specified Application.

CLO5. Introduce P and NP classes.

Module – 1

Preamble: The advancement in science and technology enhance the performance of processor, which proportionally affect the characteristics of computer system, such as security, scalability and reusability. Important problems such as sorting, searching, string processing, graph problems, Combinational problems, numerical problems are basic motivations for designing algorithm and analyzing it. Since algorithm design techniques are growing at a fast pace, it has become important for IT professionals to upgrade their knowledge in order to meet growing industry demand.

Introduction: What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework- Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency.

Performance Analysis: Estimating Space complexity and Time complexity of algorithms.

Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation ( ) with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples problems.

Brute force design technique: Selection sort, sequential search, string matching algorithm with complexity Analysis.

Textbook 1: Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section 3.1,3.2)
Textbook 2: Chapter 1(section 1.1,1.2,1.3)

- 10 Hours

Module – 2

Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master's theorem, Divide and Conquer algorithms and complexity Analysis, Finding the maximum &minimum, Binary search, Merge sort, Quick sort.

Decrease and Conquer Approach: Introduction, Insertion sort, Topological Sorting. It's efficiency analysis.

Textbook 2: Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6)
Textbook 1: Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.3)

- 8 Hours

Module – 3

Greedy Method: General method, Coin Change Problem, Knapsack Problem, solving Job sequencingwith deadlines Problems.

Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm with performance analysis.

Single source shortest paths: Dijkstra's Algorithm.

Optimal Tree problem: Huffman Trees and Codes.

Transform and Conquer Approach: Introduction, Heaps and Heap Sort.
Textbook 1: Chapter 9
Textbook 2: Chapter 4(Sections 4.1,4.3,4.5,4.6)

- 8 Hours

Module – 4

Dynamic Programming: General method with Examples, Multistage Graphs, Knapsack problem,

Bellman-Ford Algorithm, Travelling Sales Person problem, Optimal Binary tree method.

Textbook 1: Chapter 8(Section 8.4)
Textbook 2: Chapter 5 (Sections 5.1,5.2,5.4,5.9)

- 7 Hours

Module – 5

Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Problems.

Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem

NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

Textbook 1: Chapter 12 (Sections 12.1,12.2) Chapter 11(11.3)
Textbook 2: Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5) Chapter 11 (Section 11.1)

- 7 Hours

Course outcomes (Course Skill Set)

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

CO1. Analyze various algorithms, state the efficiency using asymptotic notations and mathematically represent the complexity of the algorithm.

CO2. Explain the classes P, NP, and NP-Complete and be able to prove that a certain problem is NP-Complete.

CO3. Explain important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking) and apply when an algorithmic design situation calls for it.

CO4. Apply an algorithm using appropriate design strategies for problem solving.

Question paper pattern:

Assessment Details (both CIE and SEE)

1. Each internal test (two in a semester) to be conducted for forty marks.
2. Average of both the test marks are scaled down to ***25 marks***, a minimum of ten marks is to be scored by the student.
3. Two AATs are to be carried out in this scheme, but there is an exception for PBL (Project Based Learning- alone can be offered as AAT). It is decided to offer PBL for this course.
4. PBL is evaluated for ***25 marks***, a minimum of ten marks is to be scored by the student.
5. A Minimum of 20 marks to be scored in CIE out of 50 marks (Both components put together).
6. SEE examination for the Lab is to be conducted for 100 marks and reduced to 50.
7. Minimum of ***18 marks*** is to be scored in SEE examination.

Note: A total mark of 40 is to be scored by the students in this course from both CIE and SEE together out of 100.

Textbooks

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

Reference Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – IV

MICROCONTROLLERS (3:0:2:0) 4
(Effective from the academic year 2023 -24)

Course Code	**BCS402**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Number of Contact Hours	40 hours Theory + 8-10 Lab Slots	Exam Hours	3 Hours

Course Objectives:
This course will enable students to:
1: Understand the fundamentals of ARM-based systems and basic architecture of CISC and RISC.
2: Familiarize with ARM programming modules along with registers, CPSR and Flags.
3: Develop ALP using various instructions to program the ARM controller.
4: Understand the Exceptions and Interrupt handling mechanism in Microcontrollers.
5: Discuss the ARM Firmware packages and Cache memory policies.

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

CO1: Understand the ARM Architectural features and Instructions.
CO2: Interpret programs using ARM instruction set for an ARM Microcontroller.
CO3: Relate C-Compiler Optimizations and portability issues in ARM Microcontroller.
CO4: Analyze the concepts of Exceptions and Interrupt handling mechanisms in developing applications.
CO5: Assess the role of Cache management and Firmware in Microcontrollers.

Module – 1

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

Textbook 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5
RBT: L1, L2, L3 **(8 Hours)**

Module – 2

Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants.

Textbook 1: Chapter 3 - 3.1 to 3.6
RBT: L1, L2, L3 **(8 Hours)**

Module – 3

C Compilers and Optimization: Basic C Data Types-Local variable types, Function Argument Types, Signed and Unsigned Types, C Looping Structures-Loops using fixed and variable number of iterations, Register Allocation, Function Calls, Portability Issues.

Textbook 1: Chapter 5.1 to 5.5 and 5.13
RBT: L1, L2, L3

Module – 4

Exception and Interrupt Handling: Exception handling, ARM processor exceptions and modes, vector table, exception priorities, link register offsets, interrupts, assigning interrupts, interrupt latency, IRQ and FIQ exceptions, basic interrupt stack design and implementation.

Firmware: Firmware and bootloader, ARM firmware suite.

Textbook 1: Chapter 9.1 and 9.2, Chapter 10.1
RBT: L1, L2, L3 **(8 Hours)**

Module – 5

Caches: The Memory Hierarchy and Cache Memory, Caches and Memory Management Units: CACHE Architecture: Basic Architecture of a Cache Memory, Basic Operation of a Cache Controller, The Relationship between Cache and Main Memory, Set Associativity, Write Buffers, Measuring Cache Efficiency, CACHE POLICY: Write Policy—Write back or Write through, Cache Line Replacement Policies, Allocation Policy on a Cache Miss.

Textbook 1: Chapter 12.1 to 12.3
RBT: L1, L2, L3 **(8 Hours)**

Practical Component of IPCC:

Software:

1. Develop and simulate ARM ALP for Data Transfer, Arithmetic and Logical operations (Demonstrate with the help of a suitable program).
2. Develop an ALP to multiply two 16-bit binary numbers.
3. Develop an ALP to find the sum of first 10 integer numbers.
4. Develop an ALP to find the largest/smallest number in an array of 32 numbers.
5. Develop an ALP to count the number of ones and zeros in two consecutive memory locations.
6. Simulate a program in C for ARM microcontroller using KEIL to sort the numbers in ascending/descending order using bubble sort.
7. Simulate a program in C for ARM microcontroller to find factorial of a number.

Hardware: Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

8. Interface and Control a DC Motor.
9. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
10. Interface a DAC and generate Triangular and Square waveforms.

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Text Books:

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developer's guide, Elsevier, Morgan Kaufman publishers, 2008.

References:

1. Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019.

2. Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – IV

Database Management System (3:0:2) 4

(Effective from the academic year 2023 -24)

Course Code	**BCS403**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40 hours Theory + 8-10 Lab slots	Exam Hours	100

Course objectives:

This course will enable students :

CLO1. To Provide a strong foundation in database concepts, technology, and practice.

CLO2. To Practice SQL programming through a variety of database problems.

CLO3. To Understand the relational database design principles.

CLO4. To Demonstrate the use of concurrency and transactions in database.

CLO5. To Design and build database applications for real world problems.

CLO6. To become familiar with database storage structures and access techniques.

MODULE-1

Preamble: Database Management Systems course is intended to deliver students the elementary concepts of a database management system and equips them to design and implement a database application built over those concepts. It also introduces advanced level areas like transaction processing, concurrency control and recovery management.

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization.

Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10 **(8 Hours)**

MODULE-2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

Textbook 1: Ch 5.1 to 5.3, Ch 8.1 to 8.5; Ch 9.1 to 9.2

Textbook 2: 3.5 **(8 Hours)**

MODULE-3

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **(8 Hours)**

Textbook 1: Ch 14.1 to 14.7, Ch 6.1 to 6.5

MODULE-4
SQL: SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL **SQL: Advanced Queries:** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. **Textbook 1: Ch 6.1 to 6.5,Ch 7.1 to 7.3 (8 Hours)**
MODULE-5
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Textbook 1: Ch 20.1 to 20.6,Ch 21.1 to 21.5 (8 Hours)**

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Create a table called Employee & execute the following. **Employee(EMPNO,ENAME,JOB, MANAGER_NO, SAL, COMMISSION)** 1. Create a user and grant all permissions to the user. 2. Insert the any three records in the employee table contains attributes EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result. 3. Add primary key constraint and not null constraint to the employee table. 4. Insert null values to the employee table and verify the result.
2	Create a table called Employee that contain attributes EMPNO, ENAME, JOB, MGR,SAL & execute the following. 1. Add a column commission with domain to the Employee table. 2. Insert any five records into the table. 3. Update the column details of job 4. Rename the column of Employ table using alter command. 5. Delete the employee whose Empno is 105.
3	Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by,Orderby. **Employee(E_id, E_name, Age, Salary)** 1. Create Employee table containing all Records E_id, E_name, Age, Salary. 2. Count number of employee names from employee table 3. Find the Maximum age from employee table. 4. Find the Minimum age from employee table. 5. Find salaries of employee in Ascending Order. 6. Find grouped salaries of employees.
4	Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary.

	CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY)
5	Create cursor for Employee table & extract the values from the table. Declare the variables ,Open the cursor & extract the values from the cursor. Close the cursor. **Employee(E_id, E_name, Age, Salary)**

Course outcomes (Course Skill Set):

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

CO1. Describe the basic elements of a relational database management system

CO2. Design entity relationship for the given scenario.

CO3. Apply various Structured Query Language (SQL) statements for database manipulation.

CO4. Analyse various normalization forms for the given application.

CO5. Develop database applications for the given real world problem.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50) :

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.
- **CIE for the practical component of the IPCC :**
- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.

- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC :

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Text Books:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

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

Mini Project:

- Project Based Learning

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – IV

Analysis & Design of Algorithms Lab (0:0:2) 1

(Effective from the academic year 2023 -24)

Course Code	BCSL404	CIE Marks	50
Teaching Hours/Week	2	SEE Marks	50
Total Number of Contact Hours	28 Hours	Exam Hours	2

Course objectives:

- To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
- To apply diverse design strategies for effective problem-solving.
- To Measure and compare the performance of different algorithms to determine their efficiency and suitability for specific tasks.

Sl.No	Experiments
1	Sort a given set of n integer elements using Selection Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++, how the brute force method works along with its time complexity analysis: worst case, average case and best case.
2	Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
3	Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C++how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
4	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
5	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
6	Design and implement C/C++ Program to find shortest paths from a given vertex in a weighted connected graph to other vertices using Dijkstra's algorithm.

7	Design and implement C/C++ Program to obtain the Topological ordering of vertices in a given digraph.
8	Design and implement C/C++ Program to solve 0/1 Knapsack problem using Dynamic Programming method.
9	Design and implement C/C++ Program to find a subset of a given set S = {sl , s2, ... ,sn} of n positive integers whose sum is equal to a given positive integer d.
10	Design and implement C/C++ Program for N Queen's problem using Backtracking.

Course outcomes (Course Skill Set):

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

CO1: Develop programs to solve computational problems using suitable algorithm design strategy.

CO2: Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical).

CO3: Make use of suitable integrated development tools to develop programs.

Assessment Details (both CIE and SEE)

Lab Evaluation Scheme

1. Ten marks for every experiment (10 X 10 = 100 marks), round it off to ***30 marks***.
2. Ten marks for every experiment will be evaluated for write-up, program execution, the procedure followed while execution and viva voce after each exercise.
3. Internal practical test for 100 marks to be given and the marks scored will be scaled down to ***20 marks***.
4. A Minimum of ***20 mark*** is to be scored in CIE.
5. SEE examination for the Lab is to be conducted for 100 marks and reduced to ***50 marks***.
6. A Minimum of ***18 marks*** is to be scored in SEE.

Note: Open Ended experiment will be done by the students in the Lab session. A total mark of 40 is to be scored by the student from both CIE and SEE together out of 100.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Virtual Labs (CSE): http://cse01-iiith.vlabs.ac.in/

SYLLABUS FOR ENGINEERING SCIENCE COURSE (ESC/ETC/PLC)

DEPARTMENT OF MATHEMATICS
Choice Based Credit System (CBCS)
SEMESTER – IV

Discrete Mathematical Structures (2:2:0) 3

(Effective from the academic year 2023-2024)

Course Code	BCS405A	CIE Marks	50
Teaching Hours/Week (L: T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
2. Interpret and solve the language associated with logical reasoning, relations, and functions.

Preamble: Discrete Mathematics course introduces students to the mathematics of discrete structures which build the mathematical foundation of Information Technology. Discrete mathematics has wide variety of application in problem analysis, decision making and provides adequate basics for the IT students who will be taking advanced courses like Security, Machine Learning and the Theory of Computing. The concepts of counting, mathematical induction, functions, relations, and graph theory provides an applied introduction to model mathematical concepts to the real word applications.

Module – I

Fundamentals of Logic: Basic connectives and Truth tables, Tautologies, Logical Equivalence: The laws of logic, Logical implications, Rules of inference.

Applications: Quantifiers and proofs of Theorems.

(08 Hours)

Module – II

Relations: Properties of relations, Equivalence relations, Partitions, Partial orders and Extremal elements in posets.

Applications: Hassediagrams

(8 Hours)

Module –III

Functions: Types of function, Properties of functions, Compositionof functions, Inverse functions and Invertible Functions

Applications: The pigeonhole principle

(08 Hours)

Module – IV

Mathematical Induction, Recursive Definitions and Recurrence Relations:
Method of mathematical induction, Recursive definition, First order linear recurrence relation-Formulation problems and examples. Second order linear homogeneous recurrence relations with constant coefficients.

Applications: Statement problems on recurrence relations (applicable to real life)

(08 Hours)

Module – V

Fundamental Principles of Counting: Overview, The rule of sum and product, Permutations, Combinations and Combinations with repetition.

Applications: **The Principles of Inclusion and Exclusion:** Generalization of the principle, Derangements- Nothing is in its right place.

(08 Hours)

Course Outcomes:

The Students should be able to

CO1: Apply mathematical logic in the analysis of logical statements and simplification of switching circuits.

CO2: Use properties of relations and functions in theoretical algorithms.

CO3: Apply mathematical induction to analyzes recursive and non-recursive concepts.

CO4: Use set theory and its applications in solving analytical problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										

Level 3: Highly mapped Level 2: Moderately mapped

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered.
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks.

Text books	
1.	Ralph P. Grimaldi and B V Ramana, Discrete and Combinatorial Mathematics- An Applied Introduction, Pearson Education, Asia, Fifth edition – 2007. ISBN 978-81-7758-424-0.
2.	J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata – McGraw Hill, 35TH reprint 2008. ISBN 13:978-0-07-463113-3.
References	
1.	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata – McGraw Hill, Sixth Edition, Sixth reprint 2008. ISBN-(13):978-0-07-064824-1.
2.	C. L. Liu and D P Mohapatra, Elementary Discrete Mathematics, Tata- McGraw Hill, Sixth Edition, ISBN: 10:0-07-066913-9.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program.
- http://www.themathpage.com/
- http://www.abstractmath.org/
- http://www.ocw.mit.edu/courses/mathematics/

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

- Quizzes
- Assignments
- Seminar

DEPARTMENT OF MATHEMATICS

BACHELOR OF ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - IV

Graph Theory (2:2:0:0) 3

(Common to CSE/ISE/AI&ML)

(Effective from the academic year 2023-24)

Course Code	BCS405B	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	20 hours Theory + 20 Hours Tutorial	Exam Hours	3 Hours

Course Objectives:

This course aims to prepare the students to:

1. Understand the basics of graph theory and their various properties
2. Model problems using graphs and to solve these problems algorithmically.
3. Apply graph theory concepts to solve real world applications like routing, TSP/traffic control, etc.

Teaching-Learning Process

Pedagogy (General Instructions):

Teachers can use the following strategies to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1: Introduction to Graph Theory

Definitions and Examples, Standard graphs - complete graph, regular graph, Peterson graph, bipartite graph, complete bipartite graph. Subgraphs, Regular graphs, wheels, Induced subgraphs, Subgraphs - proper subgraph, spanning subgraph, induced subgraph. Isomorphism of graphs. Walk, trial, path, cycle, connectedness, Euler circuits and Euler trails. (8 Hours)

Applications: Konigsberg bridge problem.

(RBT Levels: L1, L2 and L3)

Module-2: Planar Graphs
Planar and non-planar graphs, Combinatorial representation, Hamilton Paths and Cycles, Kuratowski's graph, Kuratowski's theorem, Outer planar graphs, Maximal planar graphs, Euler's formula, crossing number, Dual of a planar graphs, Euler's polyhedral formula. (8 Hours) **Applications:** Detection of planarity using elementary reduction method **(RBT Levels: L1, L2 and L3)**
Module-3: Trees
Trees and their basic properties, examples. Types of trees - rooted trees, spanning trees, binary trees, Sorting, Prefix Codes and Weighted trees. (8 Hours) **Applications:** DFS and BFS Algorithms. **(RBT Levels: L1, L2 and L3)**
Module-4: Graph coloring
Vertex coloring, Chromatic number of a graph, Results for general graphs, The chromatic polynomial of a graph, Basic properties of chromatic polynomial, Decomposition theorem, Multiplication theorem. Map coloring. (8 Hours) **Applications:** Five color theorem **(RBT Levels: L1, L2 and L3)**
Module-5: Optimization and Matching
Minimal spanning trees - Kruskal and Prim's algorithm, Dijikstra's shortest path algorithm. Transport Networks – Max-flow, Min-cut Theorem, Matching Theory. (8 Hours) **Applications:** Travelling salesman problem - nearest neighbourhood method. **(RBT Levels: L1, L2 and L3)**
Course outcomes: The students will be able to: CO1: Understand the knowledge of fundamental concepts in graph theory. CO2: Examine for the existence of graph structures by suitable graph algorithms, tree structures, planarity. CO3: Analyze and find the solution for coloring problems by suitable graph theoretical concepts. CO4: Demonstrate algorithms used in interdisciplinary engineering domains.
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation:** • For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. • The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been

covered.

- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks.

Text books:

1. Narsingh Deo, Graph theory with applications to engineering and computer Science, PHI, 1979.
2. Gary Chartrand and Ping Zang, Introduction to graph theory, Tata McGraw-Hill addition 2006.
3. F. Harary, Graph theory, Narosa publishing house, New Delhi, 2013.

Reference Books: (Name of the author/Title of the Book/ Name of the publisher/Edition and Year)

1. Douglas B. West, "Introduction to graph theory", 2nd Edition, PHI, 2001, ISBN-9780130144003, 0130144002.
2. Geir Agnarsson and Raymond Greenlaw, Graph theory-Modeling, application and Algorithm, Pearson publications, 1998
3. Cormen T.H., Leiserson C. E, Rivest R.L., Stein C., Introduction to Algorithms, 3rd Edition, PHI 2010, ISBN:9780262033848

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

- Programming Assignment
- Seminars

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DEPARTMENT OF MATHEMATICS

Choice Based Credit System (CBCS)

SEMESTER - IV

Optimization Technique (2:2:0) 3

(Common to CSE/ISE/AI&ML/CSBS Branches)

(Effective from the academic year 2023-24)

Course Code	BCS405C	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0	SEE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	Total Marks	100
Credits	03	Exam Hours	03
Total Hours of Pedagogy	40		

Course Objectives: The goal of the course is to

- To understand the methodology of OR problem solving and formulate linear programming problem.
- To develop formulation skills in transportation models and assignment problems hence find solutions.
- To understand the basics in the field of game theory.

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. In addition to the traditional lecture method, different types of innovative teaching methodsmay be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with engineering studies and provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module – 1
Introduction to LPP and Solution to LPP: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR, Linear Programming Problem (LPP), Generalized LPP- Formulation of problems as L.P.P. Solutions to LPP by graphical method (Two Variables). **RBT: L1, L2, L3** **(8 hours)**
Module – 2
Simplex method and Big-M method: Simplex method, Canonical and Standard form of LP problem, slack, surplus and artificial variables, Solutions to LPP by Simplex method, Big-M Method, Degeneracy in LPP. **RBT: L1, L2, L3** **(8 hours)**
Module - 3
Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel's Approximation method. Unbalanced T.P, Finding optimal solution by MODI method, Maximization T.P. Degeneracy in transportation problems. **RBT: L1, L2, L3** **(8 hours)**
Module - 4
Assignment Problem: Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP). **RBT: L1, L2, L3** **(8 hours)**
Module – 5
Game Theory: Definition, Pure Strategy problems, Saddle point, Max-Min and Min-Max criteria, Principle of Dominance, Solution of games with Saddle point. Mixed Strategy problems. Solution of 2X2 games by Arithmetic method, Solution of 2Xn and mX2 games by graphical method. Formulation of games. **RBT: L1, L2, L3** **(8 hours)**

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books:

1. Operations Research - S.D.Sharma, Kedar nath Ram nath & Co, 2008.
2. Operations Research - Theory and Applications, J.K Sharma, Macmillan Publications India Ltd, 2013.
3. Kanti swaroop, P.K.Guptha and Man Mohan: Operation Research. Sultan Chand.

Reference Books:

1. Operations Research - H.A.Taha, Pearson, 7th Edition, June 2002.
2. Introduction to Operations Research - Hiller and Liberman, MGH, 7th Edition, 2002.
3. S.K Sinha: Reliability and life testing. Wiley Eastern.

Web links and Video Lectures (e-Resources):

1. http://www2.informs.org/Resources/
2. http://www.mit.edu/~orc/
3. http://www.ieor.columbia.edu/
4. http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.html

Course outcomes (COs):

At the end of the semester the students are able to

CO1	Formulate, Solve and Optimize linear programming problems using appropriate techniques theoretically as well as graphically and interpret the results obtained.
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.
CO3	Interpret the assignment models' solutions and infer solutions to the real-world problems.
CO4	Model competitive real-world phenomena using concepts from game theory. Analyse pure and mixed strategy games.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										
CO2	**3**	**2**										
CO3	**3**	**2**										
CO4	**3**	**2**										

Level 3: Highly mapped Level 2: Moderately mapped Level 1: Low mapped

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered.
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks.

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DEPARTMENT OF MATHEMATICS

Choice Based Credit System (CBCS)

SEMESTER - IV

Linear Algebra (2:2:0) 3

(Effective from the academic year 2023-24)

Course Code	BCS405D	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	Total Marks	100
Credits	03	Exam Hours	03
Total Number of Contact Hours	40		

Course Objectives: The goal of the course is to

- To equip the students with standard concepts and tools in Linear algebra which will find them useful in their disciplines.
- Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
- Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module – 1

VECTOR SPACES: Introduction, Vector spaces, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence, Basis and Dimension, Coordinates.

RBT: L1, L2, L3 **(8 hours)**

Module – 2

LINEAR TRANSFORMATIONS: Introduction, Linear Mappings, Geometric linear transformation of i2, Kernel and Image of a linear transformations, Rank-Nullity Theorem (No proof), Matrix representation of linear transformations, Singular and Non-singular linear transformations, Invertible linear transformations

RBT: L1, L2, L3 **(8 hours)**

Module - 3

EIGENVALUES AND EIGENVECTORS: Introduction, Polynomials of Matrices, Applications of Cayley-Hamilton Theorem, Eigen spaces of a linear transformation, Characteristic and Minimal Polynomials of Block Matrices, Jordan Canonical form.

RBT: L1, L2, L3 **(8 hours)**

Module - 4

INNER PRODUCT SPACES: Inner products, inner product spaces, length and orthogonality, orthogonal sets and Bases, projections, Gram-Schmidt process, QR-factorization, least squares problem and least square error.

RBT: L1, L2, L3 **(8 hours)**

Module – 5

OPTIMIZATION TECHNIQUES IN LINEAR ALGEBRA: Diagonalization and Orthogonal diagonalization of real symmetric matrices, quadratic forms and its classifications, Hessian Matrix, Method of steepest descent, Singular value decomposition. Dimensionality reduction – Principal component analysis.

RBT: L1, L2, L3 **(8 hours)**

Suggested Learning Resources:
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books:

1. David C. Lay, Steven R. Lay, Judi J Mc. Donald: "Linear Algebra and its applications", Pearson Education, 6th Edition, 2021.

Gilbert Strang: "Linear Algebra and its applications", Brooks Cole, 4th edition, 2005.**Reference**

Reference Books:

1. **Richard Bronson & Gabriel B. Costa**: **"Linear Algebra: An Introduction**", 2nd edition. Academic Press, 2014.
2. **Seymour Lipschutz, Marc Lipso: "Theory and problems of linear algebra",** Schaum's outline series - 6th edition, 2017, McGraw-Hill Education.
3. **Marc Peter Deisennroth, A. Aldo Faisal, Cheng Soon Ong**: **"Mathematics for Machine learning"**, Cambridge University Press, 2020.

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/index.htm

- https://www.math.ucdavis.edu/~linear/linear.pdf
- https://www.coursera.org/learn/linear-algebra-machine-learning
- https://nptel.ac.in/syllabus/111106051/
- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program.

Course outcomes (COs):

At the end of the semester the students are able to

CO1	Explain the concepts of vector spaces, subspaces, bases, dimension and their properties.
CO2	Use matrices and linear transformations to solve the given problem.
CO3	Compute Eigenvalues and Eigenvectors for the linear transformations
CO4	Determine orthogonality of inner product spaces.
CO$	Apply the optimization techniques to solve the problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										
CO2	**3**	**2**										
CO3	**3**	**2**										
CO4	**3**	**2**										
CO5	**3**	**2**										

Level 3: Highly mapped Level 2: Moderately mapped Level 1: Low mapped

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered.
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

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

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks.

SYLLABUS FOR

ABILITY ENHANCEMENT COURSE / SKILL ENHANCEMENT COURSE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – IV

Green IT and Sustainability (1:0:0) 1

(Effective from the academic year 2023-24)

Course Code	BCS456A	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	14	Exam Hours	1 Hour

Course Objectives:

This course will enable students to:

CLO1: Understand challenges for Green ICT and the environmental impact.

CLO2: Learn different aspects of ICT metrics and Sustainable Cloud Computing.

CLO3: Explore effects of software design on sustainability.

Module – 1

Green ICT -History, Agenda, and Challenges Ahead: Introduction, Industrial Revolution, The Emergence of Information and Communication Technologies, The Agenda and Challenges Ahead. **(3 Hours)**

Module – 2

Emerging Technologies and Their Environmental Impact: Introduction, Number of Connected Devices , Increased , Functionality, Increased Number of Separate Functions , Increased Demand for Speed and Reliability , Obsolescence—The Problem of Backward Compatibility, The Other Side of the Balance Sheet, Video conference as an Alternative to Business Travel, Dematerialization of Product Chain, Travel Advice/Road Traffic Control, Intelligent Energy Metering , Building Management Systems, Saving IT. **(3 Hours)**

Module – 3

Measurements and Sustainability: Introduction, ICT Technical Measures, Ecological Measures and Ethical Consideration, Systems Engineering for Designing Sustainable ICT-Based Architectures. **(3 Hours)**

Module – 4

Sustainable Cloud Computing: Introduction, Challenges in the Use of Cloud Computing As Green Technology, Cloud Computing and Sustainability, Sustainable Applications of Cloud Computing, Technologies Associated With Sustainable Cloud Computing, Future Prospects of Sustainable Cloud Computing, Reflections on Sustainable Cloud Computing Applications. **(3 Hours)**

Module – 5

Sustainable Software Design: Overview and Scope, Evaluating Sustainability Effects , Sustainability and the Product Life Cycle , Direct Effects: Sustainability During Use, Runtime Energy Consumption Basics , Analyzing the Energy Consumption of an Application , Energy Consumption Reduction Using Physical Properties of Semiconductors, Optimizing the Energy Consumption of an Application: Compiler Techniques, Optimizing the Energy Consumption of an Application: Runtime Approaches. **(2 Hours)**

Course outcome (Course Skill Set)

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

CO1: Classify the challenges for Green ICT

CO2: Relate the environmental impact due to emerging technologies.

CO3: Demonstrate different aspects of ICT metrics.

CO4: Compare the various parameters related to Sustainable Cloud Computing.

CO5: Interpret the effects of software design on the sustainability.

Question paper pattern:

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

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

Semester End Examinations (SEE)

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

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Green Information Technology – A Sustainable Approach, Mohammad Dastbaz Colin Pattinson, Babak Akhgar, Elsevier, 2015 Inc.
2. San Murugesan; G. R. Gangadharan, Harnessing Green IT: Principles and Practices, Wiley-IEEE Press

Web links and Video Lectures (e-Resources)

- https://www.youtube.com/watch?v=kvn_-mJ2tSo
- https://www.youtube.com/watch?v=kxngsYn5N3Y
- https://www.youtube.com/watch?v=EgdFi3sCgzU
- https://www.brightest.io/sustainability-measurement
- https://www.youtube.com/watch?v=S2m49Op25Zw

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – IV

Capacity Planning for IT (1:0:0) 1
(Effective from the academic year 2023 -24)

Course Code	**BCS456B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	14	Exam Hours	1 Hour

Course Objectives:
This course will enable students to:

- Understand requirement and measurements for capacity planning, measurement and monitoring.
- Measurement of data for prediction towards planning process.
- Understand concepts related to deployment, installation, configuration, and management.
- Role of virtualization and cloud services in capacity planning.

Module – 1

Goals, Issues, and Processes: capacity planning, Quick and Dirty Math, Predicting When Your Systems Will Fail, Make Your System Stats Tell Stories, Buying Stuff: Procurement Is a Process, Performance and Capacity: Two Different Animals, The Effects of Social Websites and Open APIs.
Setting Goals for Capacity: Different Kinds of Requirements and Measurements, Architecture Decisions. **(4 Hours)**

Module – 2

Measurement: Units of Capacity: Aspects of Capacity Tracking Tools, Applications of Monitoring. **(3 Hours)**

Module – 3

Measurement: API Usage and Its Effect on Capacity, Examples and Reality.
Predicting Trends: Riding Your Waves. **(3 Hours)**

Module – 4

Predicting Trends: Procurement, The Effects of Increasing Capacity, Long-Term Trends, Iteration and Calibration.
Deployment: Automated Deployment Philosophies, Automated Installation Tools, Automated Configuration. **(3 Hours)**

Module – 5

Virtualization and Cloud Computing: Virtualization, Cloud Computing, Computing Resource Evolutions, Mixed Definitions, Cloud Capacity, Use it or lose it (your wallet), Measuring the clouds, Cloud Case Studies, Cloud Use Case: Anonymous Desktop Software Company. **(4 Hours)**

Course outcome (Course Skill Set)

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

- Identify the requirement and measurements for capacity planning by considering the goal, issues, and processes.
- Explain capacity measurement and monitoring.
- Make use of measurement data for prediction towards overall planning process.
- Explain the concepts related to deployment, installation, configuration, and management.
- Demonstrate how the virtualization and cloud services fit into a capacity plan.

Question paper pattern:
SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is

MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Text Books:

1. John Allspaw, The Art of Capacity Planning, 2008, O'Reilly

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=w0cD26CLBA0
- https://www.youtube.com/watch?v=5-hhfBXykec
- https://www.youtube.com/watch?v=9e4IohiFmZ8&t=63s
- https://www.youtube.com/watch?v=qj4ziswxupE
- https://www.youtube.com/watch?v=jTW79ofC6Go
- https://www.youtube.com/watch?v=_pPlanX5wQY

B.E COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – IV

UI/UX Laboratory (0:0:2) 1

(Effective from the academic year 2023-24)

Course Code	**BCS456C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50
Total Number of Contact Hours	28 Hours	Exam Hours	2

Course objectives:

- Understand the importance of the User Interface Design process.
- To make the learners familiar with the importance of requirement, user analysis and different levels of design for a particular project and the techniques to be used.
- To introduce them to Figma tool- a tool for prototyping

Sl. No	Experiments
1	Design a Logo for an E-Commerce app
2	Design an email that showcases a promotional offer of the e-commerce app.
3	Design brochure that showcases different features of the e-commerce app
4	Create sketches and low-fidelity wire frames and experiment the user testing
5	Create High-Fidelity Mockups & Prototypes from the wireframes.
6	Figma basics: Creating basic responsive elements like buttons, input elements, etc. to understand frames, groups, layout, constraints, texts, vector, color palette,etc.
7	Basic Clickable Prototyping using figma
8	Create a Design System for an e-commerce app using Grid and Spacing, Typography, Color System, and UI elements like icons, images, buttons, Inputs, Cards, Search Bar, Lists, etc.
9	Reusing the above Design System, compose the Home page, Product Page, and Checkout Page of the e-commerce app
	Open ended Experiment
1	Create a generic prototype of any application both in Web vs. App
2	Test your sitemap using Treejack

Course outcomes (Course Skill Set):

At the end of the laboratory course the students will be able to:

CO1: Experiment with various visual design aspects.

CO2: Theme the visual look and feel of the user experiences using figma

CO3: Create effective and compelling screen based experiences.

Assessment Details (both CIE and SEE)

Lab Evaluation Scheme

1. Ten marks for every experiment (10 X 10 = 100 marks), round it off to ***30 marks***.
2. Ten marks for every experiment will be evaluated for write-up, program execution, the procedure followed while execution and viva voce after each exercise.
3. Internal practical test for 100 marks to be given and the marks scored will be scaled down to ***20 marks***.
4. A Minimum of ***20 mark*** is to be scored in CIE.
5. SEE examination for the Lab is to be conducted for 100 marks and reduced to ***50 marks***.
6. A Minimum of ***18 marks*** is to be scored in SEE.

Note: Open Ended experiment will be done by the students in the Lab session. A total mark of 40 is to be scored by the student from both CIE and SEE together out of 100.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. https://www.youtube.com/watch?v=JGLfyTDgfDc
2. https://www.youtube.com/watch?v=BOt3MNB71gI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – IV

Technical Writing using LaTeX (0:0:2) 1
(Effective from the academic year 2023 -24)

Course Code	**BCS456D**	CIE Marks	50
Teaching Hours/Week	2	SEE Marks	50
Total Number of Contact Hours	28 Hours	Exam Hours	02

Course objectives:

- To introduce the basic syntax and semantics of the LaTeX scripting language
- To understand the design of presentation(ppt), tables and figures using LateX
- To illustrate the LaTeX syntax to represent the theorems and mathematical equations
- To make use of the libraries (Tikz, algorithm) to design the diagram and algorithms in the document

Sl.NO	**Experiments**
1	Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.
2	Develop a LaTeX script to create a document that displays the sample Abstract/Summary
3	Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]
4	Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]
5	Develop a LaTeX script to create a document that contains the following table with proper labels. Table: 5.1 Student Marks sheet
6	Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document

S.No	**USN**	**Student Name**	**Marks**		
			Subject1	**Subject2**	**Subject3**
1	1BY23IS001	Name 1	89	60	90
2	1BY23IS002	Name 2	78	45	98
3	1BY23IS002	Name 3	67	55	59

	by using the subgraph concept
7	Develop a LaTeX script to create a document that consists of the following two mathematical equations $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$ $= \frac{-2 \pm \sqrt{4+32}}{2}$ $T(n) = 2^2 \left[2T\left(\frac{n}{2^2}\right) + \frac{n}{2^2}\right] + 2n$ $T(n) = 2^3 T\left(\frac{n}{2^3}\right) + n + 2n$ $T(n) = 2^3 T\left(\frac{n}{2^3}\right) + 3n..$ $T(n) = 2^i T\left(\frac{n}{2^i}\right) + in.$
8	Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document
9	Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section
10	Develop a LaTeX script to design a simple presentation structure using Beamer packages
11	Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library
12	Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

Course outcomes (Course Skill Set):

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

- Apply basic LaTeX command to develop simple document
- Develop LaTeX script to design technical presentation (ppt)
- Illustrate LaTeX script to present theorems and mathematical equations in the document
- Develop programs to generate the complete report with citations and a bibliography
- Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by

examiners.

- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. Lamport - LaTex - A Document Preparation System 2e,
2. A Short Introduction to LaTeX BY FIRUZA KARMALI (AIBARA), A book for beginners, 2019
3. Formatting Information: A Beginner's Introduction to Typesetting with LaTeX, BY PETER FLYNN, Comprehensive TeX Archive Network (2005)
4. https://www.youtube.com/watch?v=jufEPC-7v0s&list=PLLybgCU6QCGU2Hh8R3oCwZnVZry-ICY5R&index=1
5. Beamer - Overleaf, Online LaTeX Editor , https://www.overleaf.com/learn/latex/Beamer
6. https://www.colorado.edu/aps/sites/default/files/attached-files/latex_primer.pdf
7. https://www.youtube.com/watch?v=ydOTMQC7np0
8. LaTeX Tutorials (featuring Texmaker) , https://www.youtube.com/watch?v=0ivLZh9xK1Q&list=PL1D4EAB31D3EBC449
9. LaTeX TUTORIAL: [https://latex-tutorial.com/tutorials/]

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
Choice Based Credit System (CBCS)
SEMESTER – IV

BIOLOGY FOR INFORMATION TECHNOLOGY (2:0:0) 2
COMMON TO ALL INFORMATION TECHNOLOGY BRANCHES (CSE/ISE/AIML)
(Effective from the academic year 2023 -24)

Course Code	BBOC407	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	3 Hours

Course Objectives:

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

Teaching-Learning Process (General Instructions)

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

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

Module – 1

Preamble Exploring "Biology for Engineers" isn't just a scientific pursuit; it's a strategic investment in nation-building and economic growth. By bridging biology with engineering, we unlock pathways to sustainable development, innovative industries, and improved healthcare solutions. This interdisciplinary approach not only enriches our understanding of living systems but also propels us towards a future where technological advancements drive societal progress and economic prosperity. Let's harness the power of biology to engineer a brighter tomorrow for our nation and the world.

CELL BASIC UNIT OF LIFE

Introduction. Structure and functions of a cell. Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules: Properties and functions of enzymes, vitamins and hormones.

5 Hours

Module – 2

APPLICATION OF BIOMOLECULES

Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production, lipids in biodiesel and detergents production, Enzymes in biosensors fabrication, food processing, detergent formulation and textile processing.

5 Hours

Module – 3

ADAPTATION OF ANATOMICAL PRINCIPLES FOR BIOENGINEERING DESIGN

Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system.

Kidney as a filtration system.

5 Hours

Module – 4

NATURE-BIOINSPIRED MATERIALS AND MECHANISMS:

Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Plant burrs, Shark skin, Kingfisher beak. Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).

5 Hours

Module – 5

Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph

TRENDS IN BIOENGINEERING:

Muscular and Skeletal Systems as scaffolds, scaffolds and tissue engineering, Bioprinting techniques and materials. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Bioconcrete. Bioremediation. Biomining.

5 Hours

Course outcomes (Course Skill Set)

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

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

Question paper pattern:

d SEE)

1. Each internal test (two in a semester) to be conducted for forty marks.
2. Average of both the test marks are scaled down to ***25 marks***, a minimum of ten marks is to be scored by the student.
3. One AAT/Assignment is to be carried out in this scheme.
4. A Minimum of 20 marks to be scored in CIE out of 50 marks.
5. Minimum of ***18 marks*** is to be scored in SEE examination.

Note: A total mark of 40 is to be scored by the students in this course from both CIE and SEE together out of 100.

Textbooks

1. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
2. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
3. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
9. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019.
10. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
11. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
- https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009
- https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
- https://www.coursera.org/courses?query=biology
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview

- https://www.classcentral.com/subject/biology
- https://www.futurelearn.com/courses/biology-basic-concepts

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

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

BMS Institute of Technology and Management

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – IV

(Common to all branches)

Universal Human Values (UHV)

(Effective for the 2022 scheme)

Course Code	BUHK408	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	1:0:0:1	SEE Marks	50
Total Number of Contact Hours	15-hour Theory Session +15 hour Self study	Exam Hours	01
Credits	1		

Course Objectives:

This course is intended to:

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

Teaching-Learning Process (General Instructions)

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

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

Module – 1
Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations **(03 Hours)**
Module – 2
Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health. **(03 Hours)**
Module – 3
Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order. **(03 hours)**
Module – 4
Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence **(03 hours)**
Module – 5
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 **(03 hours)**
Course outcome (Course Skill Set) At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); 1.They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. 2. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). 3. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. Expected to positively impact common graduate attributes like: 1. Ethical human conduct 2. Socially responsible behaviour 3. Holistic vision of life 4. Environmentally responsible work

5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

Assessment Details (both CIE and SEE)

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

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks.

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

Semester End Examinations (SEE)

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

Textbooks and Teachers Manual	
1.	The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 97893-87034- 47-1
2.	The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G
References	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3.	The Story of Stuff (Book).
4.	SThe Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa.

8	Bharat Mein Angreji Raj – Pandit Sunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)
13	Gandhi - Romain Rolland (English)
14	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
16	A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers
18	A N Tripathy, 2003, Human Values, New Age International Publishers.
19	Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20	E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
21	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
23	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Web links and Video Lectures (e-Resources):

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

BMS Institute of Technology and Management

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Choice Based Credit System (CBCS)

SEMESTER – III to VI

NSS

(Common to all branches)

(Effective for the 2022 scheme)

Course Code	**BNSK359/459/559/659**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Module – 1

Introduction to NSS

History and growth of NSS, Philosophy of NSS, Objectives of NSS, Meaning of NSS Logo, NSS Programs and activities, administrative structure of NSS, Planning of programs / activities, implementation of NSS programs / activities, National & State Awards for NSS College Program Officer / Volunteers. **(04 Hours)**

Module – 2

Overview of NSS Programs

Objectives, special camping – Environment enrichment and conservation, Health, Family, Welfare and Nutrition program. Awareness for improvement of the status of women, Social Service program, production-oriented programs, Relief & Rehabilitation work during natural calamities, education and recreations, Selection of the problem to be addressed. (**04 Hours)**

Module – 3

NSS Activities - Group Contributions to Society / community (Activity based Learning)

Organic Farming, Indian agriculture (Past, Present, Future) Connectivity for marketing, Waste management– Public, Private and Govt. organization, 5 R's. Water conservation techniques – role of different stakeholders – implementation, preparing an actionable business proposal for enhancing the village income and approach for implementation. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education. **(06 Hours)**

Module – 4

NSS National Level Activities for Society / Community at large (Activity based Learning)

Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc. **(06 Hours)**

Module – 5

NSS Individual Activities for Local Voice (Activity based learning)

Govt. school Rejuvenation and helping them to achieve good infrastructure, Plantation and adoption of plants. Know your plants. Spreading public awareness under rural outreach programs, National integration and social harmony events. **(06 Hours)**

Course outcomes (Course Skill Set):

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

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

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

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

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

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

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Assessment Details

Weightage	**CIE – 100%**
Presentation -1 Selection of topic, PHASE-1	20 Marks
Commencement of activity and its progress – PHASE – 2	20 Marks
Case Study based Assessment – Individual performance	20 Marks
Sector wise study and its consolidation	20 Marks
Video based seminar for 10 minutes by each student at the end of the course with Report	20 Marks

Suggested Learning Resources:

Books:

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

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SEMESTER – III to VI

Sports
(Common to all Branches)
(Effective for the 2022 scheme)

Course Code	BPEK359/459/559/659	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	--
Total Number of Contact Hours	26	Exam Hours	--

Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of degree)

Course Objectives: The course will enable students to

1. Develop a healthy life style.
2. Acquire Knowledge about various stages of sports and games.
3. Focus on modern technology in sports.

Module – 1

Introduction of the game: Aim of sports and games, Brief history of the game, Nature of the game, Terminology & Modern trends of the game, Fitness & Skill tests along with Game Performance.

(06 Hours)

Module – 2

Offensive and Defensive Techno Tactical Abilities: Fitness, Fundamentals & Techniques of the game with the implementation of Biomechanics, Tactics- Drills for the Techno Tactical abilities, Individual and Group, Miner games- to implement the Techniques, Tactics and Motor abilities.

(05 Hours)

Module – 3

Team tactics and Rules of the Game: Rules and Regulations of the Game: Game rules as well as sequence of officiating, Team tactics: Offensive and Defensive team strategies and scrimmages, Practice Matches: among the group, Analysis of Techno Tactical abilities: Correction and implementation of skills and Sports Injuries and rehabilitation: First aid, PRICE treatment,

(05 Hours)

Module – 4

Sports Training: Introduction of Sports Training, Principles of Sports performance, how to increase and sustain the sports performance, Training Load & Recovery- How to increase the training load (volume/Intensity) and means and methods for Recovery, Periodization: Shorts, Medium and Long term, Physiological changes: Changes in Lung capacity, heart beats etc…

(05 Hours)

Module – 5

Organization of Sports Event: Tournament system, Planning and preparation for the competition, Ground preparation and Equipment's, Organizing an event among the group.

(05 Hours)

The above 5 modules are common to all the sports events / games, we are offering the following games**: 1. Baseball, 2. Kabaddi, 3. Table Tennis, and 4. Volleyball.**

Course outcomes:

The students will be able to:

1. Understand the importance of sports and games, inculcate healthy habits of daily exercise & fitness, Self-hygiene, good food habits, Create awareness of Self-assessment of fitness.
2. Develops individual and group techno tactical abilities of the game.
3. Increases the team combination and plan the strategies to play against opponents.
4. Outline the concept of sports training and how to adopt technology to attain high level performance.
5. Summarize the basic principles of organising sports events and concept of technology implemented to organise competitions in an unbiased manner.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation and video analysing.
- Practical classes in outdoor and indoor as per requirement.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student has to give fitness and skill tests and his performance in game will be assessed.

Textbooks

1. Barbara Bushman, "ACSM's complete guide to Fitness & Health", 2011, Human Kinetics USA
2. **Pankaj Vinayak Pathak, "*Sports and Games - Rules and Regulation*", 2019, Khel Sahitya Kendra.**
3. Hardayal Singh, *"Sports Training, General Theory & Methods"*, 1984 "Netaji Subhas, National Institute of Sports".
4. Keith A. Brown, "International Handbook of Physical Education and Sports Science", 2018, (5 Volumes) Hardcover.

References

1. Tudor O Bompa," *Periodization Training for Sports*", 1999, Human Kinetics, USA
2. Michael Boyle, "New Functional Training for Sports" 2016, Human Kinetics USA
3. Michael Kjaer, Michael Rogsgaard, Peter Magnusson, Lars Engebretsen & 3 more, "Text book of Sports Medicine: Basic Science and Clinical Aspects of Sports Injury and Physical Activity", 2002, Wiley Blackwell.
4. Scott L. Delp and Thomas K. Uchida, "Biomechanics of Movement: The Science of Sports, Robotics, and Rehabilitation", 2021, The MIT Press
5. MCARDLE W.D. "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

BMS Institute of Technology and Management

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Choice Based Credit System (CBCS)

SEMESTER – III to VI

Yoga

(Common to all Branches)

(Effective for the 2022 scheme)

Course Code	**BYOK359/459/559/659**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Course Objectives:

This course will enable students to:

1. Understand the importance of practicing yoga in day-to-day life.
2. Be aware of therapeutic and preventive value of Yoga.
3. Have a focussed, joyful and peaceful life.
4. Maintain physical, mental and spiritual fitness.
5. Develop self-confidence to take up initiatives in their lives.

Module – 1

Introduction to Yoga: Introduction, classical and scientific aspects of yoga, Importance, Types, Healthy Lifestyle, Food Habits, Brief Rules, Sithalikarana Practical classes. **(04 Hours)**

Module – 2

Physical Health: Introduction, Pre-requisites, Asana-Standing, Sitting, Supine and Prone, Practical classes. **(06 Hours)**

Module – 3

Psychological Health: Introduction Thought Forms, Kriya (Kapalabhati), Preparation to Meditation, Practical classes. **(06 Hours)**

Module – 4

Therapeutic Yoga: Mudra Forms, Acupressure therapy, Relaxation techniques Practical classes. **(06 Hours)**

Module – 5

Spirituality & Universal Mantra: Introduction, Being Human, Universal Mantra, Universal LOVE, Benefits of practice of Spirituality in day-to-day life, practical classes. **(04 Hours)**

Course Outcomes:

Students will be able to:

1. Understand the requirement of practicing yoga in their day-to-day life.
2. Apply the yogic postures in therapy of psychosomatic diseases
3. Train themselves to have a focussed, joyful and peaceful life.
4. Demonstrate the fitness of Physical, Mental and Spiritual practices.
5. Develops self-confidence to take up initiatives in their lives.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student have to perform asanas.

Textbooks

1. George Feuerstein: The yoga Tradition (Its history, literature, philosophy and practice.)

2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind. (Orient paper Backs: vision Books Pvt.Ltd., 1982.

3. B.K.S Iyenkar: Light on the Yoga sutras of patanjali (Haper Collins Publications India Pvt.,Ltd., New Delhi.)

4. Science of Divinity and Realization of Self – Vethathiri Publication, (6-11) WCSC, Erode

References

1. ***Principles and Practice of Yoga in Health Care, Publisher: Handspring Publishing Limited, ISBN: 9781909141209, 9781909141209***

2. Basavaraddi I V: Yoga in School Health, MDNIY New Delhi, 2009

3. Dr. HR. Nagendra: Yoga Research and applications (Vivekanda Kendra Yoga Prakashana Bangalore)

4. Dr. Shirley Telles: Glimpses of Human Body (Vivekanda Kendra Yoga Prakashana Bangalore)

Web resources

Web links and Video Lectures (e-Resources): Refer links

1. https://youtu.be/KB-TYlgd1wE

2. https://youtu.be/aa-TG0Wg1Ls

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SEMESTER – III to VI

Music
(Common to all Branches)
(Effective for the 2022 scheme)

Course Code	BMUK359/459/559/659	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of the Degree)

Course Objectives:

The course will enable the students to:

1. Identify the major traditions of Indian music, both through notations and aurally.
2. Analyze the compositions with respect to musical and lyrical content.
3. Demonstrate an ability to use music technology appropriately in a variety of settings.

Module – 1

Preamble: Contents of the curriculum intend to promote music as a language to develop an analytical, creative, and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition.

Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela. **(03 Hours)**

Module – 2

Compositions: Introduction to the types of compositions in Carnatic Music - Geethe, Jathi Swara, Swarajathi, Varna, Krithi, and Thillana, Notation system.

(03 Hours)

Module – 3

Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysore Vasudevacharya. **(03 Hours)**

Module – 4

Music Instruments: Classification and construction of string instruments, wind instruments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instruments

(03 Hours)

Module – 5

Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Notation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethein Malahari, and one Jathi Swara, One Nottu Swara OR One krithi in a Mela raga, a patriotic song **(14 Hours)**

Course Outcomes (COs):

The students will be able to:

CO1: Discuss the Indian system of music and relate it to other genres (Cognitive Domain)

CO2: Experience the emotions of the composer and develop empathy (Affective Domain)

CO3: Respond to queries on various patterns in a composition (Psycho-Motor Domain)

Teaching Practice:

- Classroom teaching
- ICT – PowerPoint Presentation
- Audio & Video Visualization Tools

CIE: 100 Marks

- **CIE 1** for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester
- **CIE 2** for 60 marks – A practical test conducted at the end of the semester in which the student has to recite one Sarale Varase mentioned by the examiner in three speeds. Sing / Play the Geethe in Malahari. Singing / Playing Jathi Swara / Krithi.

Textbooks

1. Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana - Vol. 1 (English), Shreenivaasa Prakaashana, 2018.

References

1. Lakshminarayana Subramaniam, Viji Subramaniam, "Classical Music of India: A Practical Guide", Tranquebar 2018.
2. R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, "The Story of Indian Music and Its Instruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019.

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SEMESTER – III to VI

NCC
(Common to all Branches)
(Effective for the 2022 scheme)

Course Code	BNCK359/459/559/659	CIE Marks	100
Teaching Hours/Week (L: T:P:S)	0:0:2:0	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of degree)

Course Objectives:
This course will enable students to:
- Understand the vision of NCC and its functioning.
- Understand the security set up and management of Border/Coastal areas.
- Acquire knowledge about the Armed forces and general awareness.

Module– 1

Introduction to National Cadet Corp: What is NCC, who can join NCC, benefits, Establishment, history, 3 wings, motto, core values, Aims, flag, song, pledge, cardinals, Organization, Director General NCC, Directorates, Uniform and Cadet ranks, Camps, Certificate exams, Basic aspects of drill.
National Integration: Importance of national integration**,** Factors affecting national integration, Unity in diversity**,** Role of NCC in nation building.
Disaster Management: What is a Disaster**,** Natural and Man-made disasters**,** Earthquake, Floods. **(04 Hours)**

Module– 2

Indian Army: Introduction to Indian Army, Command and control, Fighting & supporting arms**,** Rank structure, Major Regiments of the Army**,** Major Wars and Battles**,** Entry to the Indian Army, Renowned leaders and Gallantry Awardees.
(02 Hours)

Module– 3

Indian Air Force: Introduction to Indian Air Force, Command and control**,** Rank structure**,** Major Aircrafts, Entry to the Indian Air Force, Renowned leaders.

Indian Navy: Introduction to Indian Navy, Command and control, Rank structure, Major Ships and Submarines**,** Entry to the Indian Navy, Renowned leaders. **(02 Hours)**

Module– 4

Health and Hygiene: First Aid Protocols - CPR, Understanding Types of Bandages, Fire Fighting
Field & Battle Crafts: Field Signals using hands, Judging distance -Types of Judging Distance, Section formations-types of Section Formation **(10 Hours)**

Module– 5

Drill Practicals: Savdhan, Vishram, Salute, Turning, Marching.
(08 Hours)

Course outcomes:

The students will be able to:

CO1: Develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless service.

CO2: Get motivated and trained to exhibit leadership qualities in all walks of life and be always available for the service of the nation.

CO3: Familiarize on the issues related to social & community development and disaster management and equip themselves to provide solutions.

CO4: Get an insight of the defense forces and further motivate them to join the defense forces.

Teaching Practice:

- Blackboard/Multimedia Assisted Teaching.
- Class Room Discussions, Brainstorming Sessions, Debates.
- Activity: Organizing/Participation in Social Service Programs.
- On Ground: Drill training.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester.

Textbooks:

1. NCC Cadets Handbook –Common Directorate General of NCC, New Delhi.
2. NCC Cadets Handbook –Special(A), Directorate General of NCC, New Delhi.

References:

- Chandra B. Khanduri, "Field Marshal KM Cariappa: a biographical sketch", Dev Publications,2000.
- Gautam Sharma, "Valour and Sacrifice: Famous Regiments of the Indian Army", Allied Publishers,1990.

Department of Humanities and Social Sciences
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SEMESTER – IV

English Communications Skill II
(Common to all Branches, for Lateral Entry Diploma students)
(Effective from the academic year 2024-2025)

Course Code	**BENGDIP2**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2-NCMC	SEE Marks	-
Total Number of Lecture Hours	26	Total marks	100

Course objectives:

This course will enable students to

1. Identify the Common Errors in Writing and Speaking of English.
2. Achieve better technical writing and Presentation skills for employment.
3. Acquire Employment and Workplace communication skills.
4. Enhance their conversation and public speaking skills.

Module – 1: Advanced Vocabulary

Introduction, learning through speeches, Descriptions, Word formation, Synonyms, Antonyms, learning words through situations, Homonyms and Homophones, Words often confused, One word substitution, Phrasal verbs, Idiomatic expressions, Developing technical vocabulary, Eponyms, Jumbled sentences: Introduction, Steps to approach jumbled sentences, Unscrambling a paragraph **4 Hours**

Module – 2: Technical Reports and Proposals

Reports and Proposals: Introduction, Definition, Salient Features, Significance, Types, Use of Graphic Aids/Illustrations, Preparation and Planning, Data Collection, Analyzing and Organizing the Data, Writing and Revising, Preparing an Outline, Structure of Formal Reports, Styles of Reports, Preparing a Checklist, Sample Reports, Technical Proposals - Purpose, Importance, Types and Structure. **4 Hours**

Module – 3: Technical Writing Skills

Email and Other Writings: Introduction, Email Writing- Reasons for Popularity, Some Common Pitfalls, Guiding Principles for Composition, Maintaining Common Etiquette.

Itinerary Writing, Inter-office Memorandum (Memos), Circulars, Notice, Agenda, and Minutes, Writing Instructions, Advertising.

Blogs and Reviews: Introduction, Movie Review, Book Review, Blog Writing **6 Hours**

Module – 4: Professional Speaking Practices

Conversations, Dialogues and Debates: Introduction, Purpose of General Conversations, Features of a Good Conversation, Tips for Improving Conversations, Short Conversations, Telephonic Skills, Debate, Situational Dialogues and Role Plays.

The Art of Negotiation: Introduction, Definition, Different Types of Negotiation Styles, Tips for Win-Win Negotiation. **6 Hours**

Module – 5: Communication in Workplace.

Public Speaking: Introduction, choosing an appropriate pattern, selecting an appropriate method, Art of Persuasion, making speeches interesting, Delivering different types of speeches.

Group Discussion: Introduction, Definition, Difference between GD and debate, Number and duration, Personality traits to be evaluated, Dynamics of Group Behaviors/Group Etiquette and mannerisms, Type, opening of a GD, summarizing a discussion, Some tips for GD

Job Interviews: Introduction, Definition, Process, Stages of Interview, Types, Desirable Qualities, Preparation, Using Proper Verbal and Non-verbal Clues, Exhibiting Confidence, Tips for Success**.**

6 Hours

Course Outcomes: The students will be able to:

1. Understand and identify the Common Errors in Writing and Speaking.
2. Enhance Technical Writing and Presentation skills.
3. Exhibit Employment and Workplace communication skills.
4. Analyze and apply various Techniques of Information Transfer through presentation in different levels

Textbooks

1. "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019]

References

1. Gajendra Singh Chauhan, Technical Communication, Cengage Learning India Pvt Limited, Latest Revised Edition, 2019
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