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 Business Systems

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

Approved in the BoS meeting held on 26/07/2023

ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮತ್ತು ವ್ಯವಸ್ಥಾಪನಾ ಮಹಾವಿದ್ಯಾಲಯ

BMS Institute of Technology and Management

(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

Ref.: BMSIT&M/Exam/2023-24/ 104   **Date:** 21.09.2024

CONTINUOUS INTERNAL EVALUATION (CIE)
AND
SEMESTER END EXAMINATION (SEE) PATTERN

(Applicable to UG students admitted from the 2022 batch, effective from the Academic year 2024-25 onwards)

The UG students admitted from the 2022 batch onwards are hereby informed to note the following regarding Continuous Internal Evaluation and Semester End Examination pattern:

- The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%.

- The Minimum passing mark for the CIE is 40% of the Maximum marks (i.e. 20 marks out of 50) and for the SEE minimum passing mark is 35% of the Maximum marks (i.e. 18 out of 50 marks).

- A student will be declared to have passed the course if they secure a minimum of 40% (i.e. 40 marks out of 100) in the combined total of the CIE and SEE.

The following tables summarize the CIE and SEE Patterns for the courses of various credits:

<table>
<tr><td colspan="7" align="center">INTEGRATED PROFESSIONAL COMPETENCE COURSE (IPCC) COURSES
4 OR 3 CREDITS</td></tr>
<tr><td colspan="2" rowspan="2">Evaluation Type</td><td>Internal Assessments (IAs)</td><td>Test/ Exam Marks Conducted for</td><td>Marks to be scaled down to</td><td>Min. Marks to be Scored</td><td rowspan="2">Evaluation Details</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Theory Component</td><td rowspan="2">CIE - Internal Assessment (IA) Tests</td><td>CIE – Test 1 (1.5 hr)</td><td>40</td><td rowspan="2">20</td><td rowspan="2">-</td><td rowspan="2">The sum of the two internal assessment tests will be 80 Marks and the same shall be scaled down to 20 Marks.</td></tr>
<tr><td>CIE – Test 2 (1.5 hr)</td><td>40</td></tr>
<tr><td>CIE – CCA (Comprehensive Continuous Assessment)</td><td>CCA</td><td>10</td><td>10</td><td>-</td><td>Any one assessment method can be used from the list appended below.</td></tr>
<tr><td colspan="3" align="center">Total CIE Theory</td><td>30</td><td>12</td><td></td></tr>
<tr><td>Practical Component</td><td>CIE - Practical</td><td>30</td><td>10</td><td>-</td><td>Each laboratory experiment is to be</td></tr>
</table>

	Internal Assessments (IAs)	Test/Exam Marks Conducted for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
					assessed for **30 Marks** using appropriate rubrics.
	CIE Practical Test	20	10	-	One test after all experiments to be conducted for **20 Marks**
	Total CIE Practical		20	08	
Total CIE Theory + Practical			50	20	
SEE		100	50	18	SEE exam is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE			100	40	

Note: The assessment of the laboratory component for the IPCC courses shall be restricted to CIE only.

PROFESSIONAL CORE COURSES (PCC) / ENGINEERING SCIENCE COURSES (ESC) 03 OR 02 CREDITS					
Evaluation Type	**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests — CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks.**
	CIE – IA Tests — CIE – Test 2 (1.5 hr)	40			
	CIE - CCAs — CCA	20	20	-	Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
Total CIE Theory			50	20	
SEE		100	50	18	SEE is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE			100	40	

	NON-IPCC COURSES				
	01 CREDIT – MULTIPLE CHOICE QUESTION TYPE				
Evaluation Type	Internal Assessments (IAs)	Test/ Exam Marks Conducted for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
Continuous Internal Evaluation Component	CIE – IA Tests (MCQs)	CIE – Test 1 (1 hr)	40	40	-	The question paper pattern for this course shall be an **MCQ of 1 or 2 Marks (s)**. The questions with 2 Marks can be framed based on a higher Bloom's level. The sum of the two internal assessment tests will be **80 Marks**, and the same will be scaled down to **40 Marks**.
		CIE – Test 2 (1 hr)	40			
	CIE - CCAs	CCA	10	10	-	Any One Assessment method can be used from the list provided below.
Total CIE				50	20	
SEE (MCQ Type)			50	18	The question paper pattern for this course shall be an **MCQ of 1 or 2 Marks (s)**. The questions with 2 Marks can be framed based on higher Bloom's level. MCQ-type question papers of 50 questions with each question of a **01 Mark**, the examination duration is 01 hour.
CIE + SEE				100	40	

	PROFESSIONAL CORE COURSE LABORATORY (PCCL) /ABILITY ENHANCEMENT COURSE LABORATORY (AEC)				
	01 CREDIT				
Evaluation Type	**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation	CIE - Practical	30	30		Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE - Practical Test	50	20		One test after all experiments is to be conducted for **50 Marks** and to be scaled down to **20 Marks**.
	Total CIE	-	50	20	
Semester End Examination		100	50	18	SEE to be conducted for **100 Marks**.
CIE+SEE		100		40	

		NON-IPCC / ABILITY ENHANCEMENT COURSE (AEC)				
		01 CREDIT – DESCRIPTIVE TYPE				
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE – CCAs	CCA	20	20	-	Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
	Total CIE Theory			50	20	

SEE		100	50	18			SEE is a theory exam, conducted for **100 Marks for 02 Hours duration**, scored marks are scaled down to **50 Marks.**
CIE + SEE			100	40			

## COMPUTER AIDED ENGINEERING DRAWING (BCEDK103/BCEDK203)
3 CREDIT

Evaluation Type		Topics/ Modules	Computer Printout	Preparatory Sketch	Max Marks	Total Marks	Marks to be Scaled Down to	Min Marks to Pass
CIE	Sketch Book and CAD Modelling	Projection of Points	10	05	15	200	20	-
		Projection of Lines	10	10	20			
		Projection of Planes	20	15	35			
		Projection of Solids	40	20	60			
		Isometric Projections	20	15	35			
		Development of lateral surfaces	20	15	35			
	Test 1	Module 1 & 2	24	06	30	70	20	-
		Module 3	32	08	40			
	Test 2	Module 3	32	08	40	70		
		Module 4	24	06	30			
	CCA 1	Module 5	08	02	10	10	10	-
	CCA 2	Module 5	08	02	10			
CIE Total							50	20
SEE		Module 1 & 2	24	06	30	100	**50**	**18**
		Module 3	32	08	40			
		Module 4	24	06	30			
CIE + SEE							100	40

COMPUTER AIDED MODELLING FOR MANUFACTURING (BME305)
1 CREDIT

Evaluation Type		Topics/ Modules	Computer Printout	Preparatory Calculations / Sketch	Max Marks	Total Marks	Marks to be Scaled Down to	Min Marks to Pass
CIE	Sketch Book and CAD Modelling	Module 1	60	30	90	200	20	
		Module 2	40	20	60			
		Module 3	40	10	50			
	Test 1	Module 1	20	10	30	60	20	–
		Module 2	20	10	30			
	Test 2	Module 1	20	10	30	60		
		Module 3	20	10	30			
	CCA	Module 1	30	10	40	40	10	–
CIE Total							50	20
SEE		Module 1	30	10	40	100	50	18
		Module 2	20	10	30			
		Module 3	20	10	30			
CIE + SEE							100	40

Learning Activities for CCAs:

A faculty member may choose the following CCAs based on the needs of the course:
1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects
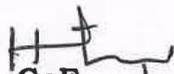
CoE 21/09/2024

Principal 21/9/2024
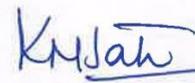
Dean - AA 21/09/24

Copy To:
1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2022, 2023, and 2024 batch.
3. Examination Section

Scheme of III Semester

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(Autonomous Institute affiliated to VTU)
Scheme of Teaching and Examination: Effective from AY 2023 – 24
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

UG PROGRAM: B.E. in Computer Science and Business Systems **Semester: III**

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	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC/BSC	BCS301	Mathematics for Computer Science	TD-: Maths PSB: Maths	3	2	0		05	50	50	100	4
2	IPCC	BCS302	Digital Design and Computer Organization	TD : CB PSB : CS	3	0	2		05	50	50	100	4
3	IPCC	BCS303	Operating Systems	TD :CB PSB : CS	3	0	2		03	50	50	100	4
4	PCC	BCS304	Data Structures and Applications	TD : CB PSB : CS	3	0	0		05	50	50	100	3
5	PCCL	BCSL305	Data Structures Lab	TD : CB PSB : CS	0	0	2		02	50	50	100	1
6	ESC	BCS306x	ESC/ETC/PLC	TD : CB PSB : CS	2	0	2		04	50	50	100	3
7	UHV	BSCK307	Social Connect and Responsibility	Any Department	0	0	2		02	100	---	100	1
8	AEC / SEC	BCB358X	Ability Enhancement Course/ Skill Enhancement Course – III	TD and PSB: Concerned department	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
9	MC	BNSK359	National Service Scheme (NSS)	NSS coordinator	0	0	2		02	100	---	100	0
		BPEK359	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK359	Yoga	Yoga Teacher									
		BNCK359	NCC	NCC coordinator									
		BMUK359	Music	Music Teacher									
									Total	**550**	**350**	**900**	**21**

Non-Credit Mandatory Course prescribed to lateral entry Diploma Students														
10	NCMC	BENGDIPI	English Communication Skill I	HSS		0	0	0	0	02	100	-	100	0

The lateral entry diploma students admitted to III semester are required to complete the English communications Skill I in the III semester and English Communications Skill II in the IV semester These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

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.
ESC: Engineering Science Course,   **ETC:** Emerging Technology Course,   **PLC:** Programming Language Course

Engineering Science Course (ESC/ETC/PLC))			
(Note- Student should opt for the course which should not be similar to the course opted in 1st Year)			
BCS306A	Object Oriented Programming with Java		
BCS306B	Object Oriented Programming with C++		

Ability Enhancement Course – III	
BCB358A	Business Communication-I

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 out between 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.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER – III

Mathematics III for Computer Science (3:2:0:0) 4
(Common to CSE/ISE/AI&ML/CSBS)
(Effective from the academic year 2023-24)

Course Code	**BCS301**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:2:0:0**	SEE Marks	**50**
Total Number of Contact Hours	**40 hours Theory + 20 Hours Tutorial**	Exam Hours	**3**

Course Objectives:

This course aims to prepare the students to:

1. To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.

2. To provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.

3. To find the association between attributes and the correlation between two variables

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

Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. Exponential distribution.

(RBT Levels: L1, L2 and L3)   **(12 Hours)**

Module – 2

Joint probability distribution & Markov Chain: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states.

(RBT Levels: L1, L2 and L3)   **(12 Hours)**

Module – 3

Statistical Inference 1: Introduction, sampling distribution, standard error, testing of hypothesis, evels of significance, test of significances, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples.

(RBT Levels: L1, L2 and L3)   **(12 Hours)**

Module – 4

Statistical Inference 2: Sampling variables, Test of Significance for means of two small samples, students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution.

(RBT Levels: L1, L2 and L3)   **(12 Hours)**

Module – 5
Curve fitting, Correlation, and Regressions Principles of least squares, Curve fitting by the method of least squares in the form $y = a + bx$, $y = a + bc + cx^2$, and $y = ax^b$. Correlation, Coefficient of correlation, Lines of regression, Angle between regression lines, standard error of estimate, rank correlation.
(RBT Levels: L1, L2 and L3)   **(12 Hours)**

Course Outcomes:
The students will be able to:

CO1: Analize various probability distributions occurring in in the modeling of various physical and engineering phenomena.

CO2: Use statistical methodology and tools in the engineering problem-solving process.

CO3: Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem.

CO4: Make use of the concepts of method of least squares, correlation and regression analysis to fit a suitable mathematical model for the statistical data.

Text books:
1. Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
2. Peter Bruce, Andrew Bruce & Peter Gedeck "Practical Statistics for Data Scientists" O'Reilly Media, Inc., 2nd edition 2020.

Reference Books:
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9 th Edition, 2006.
2. B. S. Grewal "Higher Engineering Mathematics", Khanna publishers, 44 th Ed., 2021.
3. G Haribaskaran "Probability, Queuing Theory & Reliability Engineering", Laxmi Publication, Latest Edition, 2006.
4. Irwin Miller & Marylees Miller, John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8 th edition, 2014.
5. S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S Chand and Company, Latest edition.
6. Robert V. Hogg, Joseph W. McKean & Allen T. Craig. "Introduction to Mathematical Statistics", Pearson Education 7 th edition, 2013.
7. Jim Pitman. Probability,Springer-Verlag, 1993.
8. Sheldon M. Ross,"Introduction to Probability Models" 11 th edition. Elsevier, 2014.
9. A.M. Yaglom and I. M. Yaglom, "Probability and Information". D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1983.
10. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, (Reprint), 2003.
11. S. Ross, "A First Course in Probability", Pearson Education India, 6 th Ed., 2002.
12. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 3rd Ed., 1968.
13. N.P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
14. Veerarajan T, Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Alternate Assessment Tools (AATs) suggested:
- Programming Assignment
- Seminars

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/
http://www.bookstreet.in.

VTU EDUSAT PROGRAMME – 20
VTU e-Shikshana Program

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 projectbased 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.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning
● Programming Assignment
● Seminars

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS				
Choice Based Credit System (CBCS)				
SEMESTER – III				
Digital Design and Computer Organization (3:0:2:0) 4				
(Effective from the academic year 2023 -24)				
Course Code	**BCS302**	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 + 20 hours practical**	Exam Hours	**3 Hours**	
Examination nature (SEE)	**Theory**			

Course Objectives:

This course will enable students to:

1. Read and Write Optimize Boolean equations for logic circuits.
2. Design combinational and sequential circuits using MSI components.
3. Simulate and experimentally validate sequential logic circuits.
4. Understand the structure, function, organization and architecture of modern day computing systems.
5. Examine the internal architecture and organization of the processor with an extended discussion of computer arithmetic and the instruction set architecture.

Preamble: Computer System Design course is to familiarize with concepts, design, and practical use of digital circuits and components of computer system. Digital circuits are used in designing Microcontrollers, Microprocessor, Embedded system projects and exposed to hardware design which reflects the current
industry requirements.

Module – 1
Introduction to Digital Design: Binary Logic, Boolean Functions, Digital Logic Gates, Introduction, The Map Method, Four-Variable Map, Don't-Care Conditions, NAND and NOR Implementation, QM method(tabular), Other Hardware Description Language – Verilog Model of a simple circuit.

Text book 1: 1.9, 2.4, 2.5, 2.8, 3.1, 3.2, 3.3, 3.5, 3.6, 3.9   **(8 Hours)**

Module – 2
Combinational Logic: Introduction, Combinational Circuits, Design Procedure, Binary Adder-Subtractor, Decoders, Encoders, Multiplexers (MEV). HDL Models of Combinational Circuits – Adder, Multiplexer, Encoder. **Sequential Logic**: Introduction, Sequential Circuits, Storage Elements: Latches, Flip-Flops.

Text book 1: 4.1, 4.2, 4.4, 4.5, 4.9, 4.10, 4.11, 4.12, 5.1, 5.2, 5.3, 5.4.   **(8 Hours)**

Module – 3
Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus structure, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.**Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes.

Text book 2: 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5.   **(8 Hours)**

Module – 4
Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions.

Text book 2: 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4, 5.4, 5.5.1   **(8 Hours)**

	Module – 5
	Basic Processing **Unit:** Some Fundamental Concepts: Register Transfers, Performing ALU operations, fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction. **Pipelining:** Basic concepts, Role of Cache memory, Pipeline Performance.

Text book 2: 7.1, 7.2, 8.1   (**8 Hours**)

PRACTICAL COMPONENT OF IPCC

SL. No.	**Experiments** **Experiments Simulation packages preferred: Xilinx, Modelsim, PSpice or any other relevant**
1	Given a 4-variable logic expression, simplify it using appropriate technique and simulate the same using basic gates.
2	Design a 4- bit full adder and subtractor and simulate the same using basic gates.
3	Design VHDL/Verilog HDL to implement simple circuits using structural, Data flow and Behavioral model.
4	Design Binary Adder-Subtractor – Half adder and Half Subtractor and simulate using VHDL/Verilog HDL.
5	Design Decimal adder and simulate using VHDL/Verilog HDL.
6	Design Different types of multiplexer like 2:1, 4:1 and 8:1 and simulate using VHDL/Verilog program.
7	Design and implement various types of De-Multiplexer and simulate VHDL/Verilog
8	Design and simulate VHDL/Verilog program for implementing various types of Flip-Flops such as SR, JK and D.

Course outcomes (Course Skill Set):

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

    CO1: Discuss the basic concepts of digital system components.

    CO2: Apply various minimization methods to realize the digital circuits.

    CO3: Interpret digital operations in digital circuits.

    CO4: Analyze the functioning of various units in digital systems.

Suggested Learning Resources:

TextBooks

1. M. Morris Mano & Michael D. Ciletti, Digital Design With an Introduction to Verilog Design, 5e, Pearson Education.

2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill.William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Refernces:

   1. Donald P Leach, Albert Paul Malvino & GoutamSaha, Digital Principles and Applications, Tata McGraw Hill, 6th Edition, 2006.

    Web links and Video Lectures (e-Resources):

 1. **https://cse11-iiith.vlabs.ac.in/**

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

Assign the group task to Design the various types of counters and display the output accordingly
Assessment Methods

- Lab Assessment (25marks)
- GATE Based Aptitude Test

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS)			
SEMESTER – III			
Operating Systems (3:0:2:0) 4			
(Effective from the academic year 2023 -24)			
Course Code	**BCS303**	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 + 20 hours practical**	Exam Hours	**3 Hours**
Examination Nature	**Theory**		

Course Objectives:

This course will enable students to:

1. Introduce concepts and terminology used in OS
2. Explain threading and multithreaded systems
3. Illustrate process synchronization and concept of Deadlock
4. Introduce Memory and Virtual memory management, File system and storage techniques

Preamble

Operating systems are the fundamental part of every computing device to run any type of software. The increasing use of computing devices in all areas of life (leisure, work), lead to a variety of operating systems. Yet all operating systems share common principles. These principles are important for computer science students in their understanding of programming languages and software built on top of the operating systems.This course will be discussing about the Address spaces, System call interface, Process/Threads, Inter Process Communication, Deadlock, Scheduling, Main memory, Virtual memory and File systems.

Module – 1

Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.
Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot.

Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11) **(8 Hours)**

Module – 2

Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling.

Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5) **(8 Hours)**

Module – 3

Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization.
Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlocks prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7) **(8 Hours)**

	Module – 4

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)   **(8 Hours)**

	Module – 5

File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.
Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix.

Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)   **(8 Hours)**

PRACTICAL COMPONENT OF IPCC
Sl. No.	**Program**
1	Basic Unix commands: who, 1s, ln, cp, rm, mv, chmod, chown, mkdir, rmdir, pwd,cd and so on.
2	Write a C program to demonstrate open(), read(), write() and close() system call.

3	Create the following types of a files using shell command and system call
	   a. soft link (symlink system call)
	   b. hard link (link system call)

4	Write a C program to simulate Race condition
5	Write a program to print the system resource limits. Use getrlimit system call.
6	a. Write a C program to demonstrate multitasking using fork ( ) system call. b. Write a C program that illustrates how an orphan, zombie processes are created
7	Write a program to make parent to wait for a specific child process and print the type of termination, if abnormal termination, print the signal number.
8	Write C programs that illustrate communication between two unrelated processes using named pipe (Fl FO file).
9	Write a C program a. To create a message queue and b. To send message to a message queue by mentioning message id, message and message number c. Receive message from message queue by mentioning message id and message number.
10	Write a program to create a semaphore and initialize value to the semaphore. a. create a binary semaphore b. create a counting semaphore

Course Outcomes:
The students will be able to:
CO1: Identify the structure of an operating system and its scheduling mechanism.
CO2: Demonstrate the allocation of resources for a process using scheduling algorithm.
CO3: Identify root causes of deadlock and provide the solution for deadlock elimination
CO4: Explore about the storage structures and learn about the Linux Operating system.
CO5: Analyze Storage Structures and Implement Customized Case study

Textbooks:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley- India, 2015

Reference Books:

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
   P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition,PHI(EEE), 2014.
3. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Web links and Video Lectures (e-Resources):

1. https://youtu.be/mXw9ruZaxzQ
2. https://youtu.be/vBURTt97EkA
3. https://www.youtube.com/watch?v=783KAB-tuE4&list= PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f
4. https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeRn6mkO

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

- Assessment Methods
  - Case Study on Unix Based Systems (10Marks)

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS)
SEMESTER – III
Data Structure and Applications (3:0:0:0) 3
(Effective from the academic year 2023-2024)

Course Code	**BCS304**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0:0**	SEE Marks	**50**
Total Number of Contact Hour	**40 hours**	Exam Hours	**3**

Course Objectives:
This course will enable students to:
1. Explain fundamentals of data structures and their applications essential for programming/problem Solving.
2. Utilize an appropriate data structure like Stack, Queues, Lists, Trees and Graphs to solve a given problem.
3. Demonstrate the use of appropriate data structures in implementing the algorithms while solving the real world problems

Preamble: Data Structures are a specialized means of organizing and storing data in computers in such a way that we can perform operations on the stored data more efficiently. Data structures have a wide and diverse scope of usage across the fields of Computer Science and many other fields of Engineering. Data Structures are the main part of many computer science algorithms as they enable the programmers to handle the data in an efficient way. It plays a vital role in enhancing the performance of a software.

Module – 1

Introduction: Significance and scope of Data Structures, Data Structures and Algorithms in Economic growth of Nation, Impact of Data Structures and Algorithms on societal problems, sustainable solutions, Career perspective of Data Structures and Algorithms, current innovations in Data Structures.

Data Structures: Definition, Classification and Operations, Dynamic memory allocation, Dynamic Arrays, Self-referential structures.

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays.

Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression, Multiple Stacks and Queues. Programming Examples.

Text Book: Chapter-1:1.2 Chapter-2: 2.1 to 2.7 Chapter-3: 3.1,3.2,3.6
Reference Book 1: 1.1 to 1.4 (8 Hours)

Module – 2

Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, De-queues, Priority Queues.

Recursion: Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function.

Text Book: Chapter-3: 3.3, 3.4, 3.7 Chapter-4: 4.1 to 4.4 (8 Hours)

Module – 3

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection.

Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples.

Text Book: Chapter-4: 4.5,4.7,4.8 Chapter-5: 5.1 to 5.3, 5.5 (8 Hours)

Module – 4

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Tree.

Binary Trees: Binary Tree Insert Operation, Binary Tree Traversals - Inorder, postorder, preorder, Level Order; Additional Binary tree operations.

Binary Search Trees: BST Insert and Delete operations, Application of Trees-Evaluation of Expression, Programming Examples.

Text Book: Chapter-5: 5.7 to 5.11 Chapter-6: 6.1, 6.2   **(8 Hours)**

Module – 5

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Warshal's Algorithm, Floyds Algorithm, Breadth First Search, Depth First Search.

Hashing: Definition, Hashing Functions, Hash Table, Separate chaining, Collision resolution techniques: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, and Applications of Hashing.

Text Book: Chapter 8: 8.1 to 8.3 Chapter 9: 9.1, 9.2 Chapter 10: 10.1   **(8 Hours)**

Course Outcomes:

The students will be able to:

CO1: Illustrate different types of linear data structures, its operations and algorithms to solve a given problem.

CO2: Illustrate different types of non-linear data structures, its operations and algorithms to solve a given problem.

CO3: Examine any given problem, recommend and implement solutions using suitable data structures.

CO4: Design and implement applications using suitable data structures.

Textbooks

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, Universities Press, 2nd edition, 2019
2. Seymour Lipschutz, Data Structures, Schaum's Outline Series, 1st Edition, 2014.

Reference Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, Cengage Learning, 2nd edition, 2014.
2. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, McGraw Hill, 2nd Edition, 2013.
3. Reema Thareja, Data Structures using C, 3 rd Ed, Oxford press, 2012.

Web links and Video Lectures (e-Resources)

- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://nptel.ac.in/courses/106/105/106105171/
- http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
- https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
- https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
- https://nptel.ac.in/courses/106/102/106102064/
- https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
- https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
- https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft- practice.html
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01350159 54 2807756812559/overview

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

- Coding in Online Platforms/ Certification Course/Coding Quiz

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS)
SEMESTER - III

DATA STRUCTURES LABORATORY (0:0:2) 1
(Effective from the academic year 2023-24)

Course Code	BCSL305	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	28Hours	Exam Hours	03
Examination Type		**Practical**	

Course Objectives:
This course enables students to:
1. Develop linear data structures and their applications such as stacks, queues and lists.
2. Develop non-linear data structures and their applications such as trees and graphs sorting and searching

algorithms.

Descriptions:
Design, develop, and implement the specified Data Structure as given in the list given below using C
Language under LINUX /Windows environment..

Sl. No	Programs List
1	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate Overflow and Underflow situations on Stack d. Display the status of Stack e. Exit Support the program with appropriate functions for each of the above operations.
2	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands.
3	Design, Develop and Implement a Program in C for evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
4	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of integers (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
5	Design, Develop and Implement a menu driven Program in C for the following operations on Double Ended QUEUE of integers (Array Implementation of Queue with maximum size MAX) a. Perform Insertion / Deletion at front of QUEUE b. Perform Insertion / Deletion at rear of QUEUE c. Display the status of Circular QUEUE d. Exit Support the program with appropriate functions for each of the above operations.
6	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion.

	b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue f. Exit.
8	Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
9	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using any traversal method (DFS/BFS).
10	Given a set of N employee records with a set K of Keys (4-digit) which uniquely determine the records. Assume that the records are available in the memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Develop a Program in C that uses Hash function H: K →L as H (K) = K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Course Outcomes:
The student should be able to:
CO 1:Analyze various linear and non-linear data structures
CO2: Demonstrate the working nature of different types of data structures and their applications
CO3: Use appropriate searching and sorting algorithms for the give scenario.
CO4: Apply the appropriate data structure for solving real world problems

Textbooks
1.Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, Universities Press,2nd edition, 2019

2.P Reema Thareja, Data Structures using C, 3 rd Ed, Oxford press, 2012.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS **Choice Based Credit System (CBCS)** SEMESTER – III			
Object Oriented Programming with JAVA (2:0:2)3 (Effective from the academic year 2023-24)			
Course Code	**BCS306A**	CIE Marks	**50**
Teaching Hours/Week (L: T:P: S)	**2:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**28 Hours of Theory + 20 Hours of Practical**	Total Marks	**100**
Examination Nature	**Theory**		

Note - Students who have undergone " Basics of Java Programming- BPLCK105C/205C" in first year are not eligible to opt this course

Course objectives:
1. To learn primitive constructs JAVA programming language.
2. To understand Object Oriented Programming Features of JAVA.
3. To gain knowledge on: packages, multithreaded programing and exceptions.

Preamble

The purpose of this course is to enable learners to solve problems by breaking it down to object level while designing software and to implement it using Java. This course covers Object Oriented Principles, Object Oriented Programming in Java, Inheritance, Exception handling, Event handling, multithreaded programming and working with window-based graphics. This course helps the learners to develop Desktop GUI Applications, Mobile applications, Enterprise Applications, Scientific Applications and Web based Applications.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective
1. Use Online Java Compiler IDE: https://www.jdoodle.com/online-java-compiler/ or any other.
2. Demonstration of programing examples.
3. Chalk and board, power point presentations
4. Online material (Tutorials) and video lectures.

Module – 1

An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords).

Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables.

Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses.

Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).

TextBook 1: Chapter 2, 3, 4, 5 (8 Hours)

	Module – 2	

Introducing Classes: Class Fundamentals**,** Declaring Objects**,** Assigning Object Reference Variables**,** Introducing Methods**,** Constructors**,** The this Keyword**,** Garbage Collection.
Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Understanding static, Introducing final

Text Book 1:Chapter 6, 7   **(8 Hours)**

	Module – 3	

Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class.
Interfaces: Interfaces, Default Interface Methods.

Text Book 1: Chapter 8, 9   **(8 Hours)**

	Module – 4	

Packages: Packages, Packages and Member Access, Importing Packages.
Exceptions: Exception-Handling Fundamentals**,** Exception Types**,** Uncaught Exceptions**,** Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.

Text Book 1:Chapter 9, 10   **(8 Hours)**

	Module – 5	

Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State.

Text Book 1:Chapter 11   **(8 Hours)**

	PRACTICAL COMPONENT OF IPCC	
SL. No.	**Experiments**	
1	Develop a JAVA program to add TWO matrices of suitable order N (The value of N should be read from command line arguments).	
2	Develop a stack class to hold a maximum of 10 integers with suitable methods. Develop a JAVA main method to illustrate Stack operations.	
3	Develop a JAVA program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase( ). Demonstrate polymorphism concepts by developing suitable methods, defining member data and main program.	
4	Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.	
5	Develop a JAVA program to create an interface Resizable with methods resize Width(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods.	
6	Develop a JAVA program to raise a custom exception (user defined exception) for DivisionByZero using try, catch, throw and finally.	
7	Write a program to illustrate creation of threads using runnable class. (start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).	

| | 8 | Develop a program to create a class MyThread in this class a constructor, call the base class constructor, using super and start the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently. | |

Course outcome (Course Skill Set)
At the end of the course, the student will be able to:
    CO1: Demonstrate the fundamentals of Java programming constructs.
    CO2: Interpret the object oriented features of Java programming language.
    CO3: Apply the object oriented programming constructs to solve complex problems .
    CO4: Develop the solutions using the OOP concepts for simple to complex problems.

Textbooks:
1. Herbert Schildt, "Java: The Complete Reference", Twelfth Edition, November 2021, McGraw-Hill, ISBN: 9781260463422
Reference Books
1. Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2. Bruce Eckel, "Thinking in Java", Fourth Edition,Prentice Hall,2006
    (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)

Web links and Video Lectures (e-Resources):
  1. Java Tutorial: https://www.geeksforgeeks.org/java/
  2. Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu):
     https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
  3. Java Tutorial: https://www.w3schools.com/java/
  4. Java Tutorial: https://www.javatpoint.com/java-tutorial

Alternate Assessment Tools (AATs) suggested:
I. Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
    1. Installation of Java (Refer: https://www.java.com/en/download/help/index_installing.html)
    2. Demonstration of online IDEs like geeksforgeeks, jdoodle or any other Tools
    3. Demonstration of class diagrams for the class abstraction, type visibility, composition and inheritance
II. Certification course - Infosys Spring Board
III. Coding Practice in Online Coding Platforms
Lab/Practical Assessment (25 Marks)

B.E COMPUTER SCIENCE AND BUSINESS SYSTEMS			
Choice Based Credit System (CBCS)			
SEMESTER – III			
Object Oriented Programming with C++ (40:0:26:24) 3			
(Effective from the academic year 2025 -26)			
Course Code	BCS306B	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	2:0:2:0 (Integrated)	SEE Marks	50
Total Number of Contact Hours	27 [Theory] + 13 [Practical]	Exam Hours	3 Hours
Examination Type	Theory		

Note - Students who have undergone " Introduction to C++ Programming BPLCK105D/205D" in first year are not eligible to opt this course

Course Objectives:

This course will enable students to:

1. To understand object-oriented programming using C++and Gain knowledge about the capability to store information together in an object.
2. To illustrate the capability of a class to rely upon another class and functions.
3. To Create and process data in files using file I/O functions
4. To understand the generic programming features of C++ including Exception handling

Preamble

Object oriented programming is an approach that provides a way of modularizing programs by creating partitioned memory area for both data and functions that can be used as templates for creating copies of such modules on demand. OOP is a base for learning Programming with the rapid changes in technology, there is an increasing need to keep the academia abreast of the skill set requirement of the industry. These concepts are important for computer science students in their understanding of programming languages. This course will be discussing Objects, Classes, Polymorphism, Encapsulation, data abstraction Inheritance etc.

Module – 1

An overview of C++: What is object-Oriented Programming? Introducing C++ Classes, The General Form of a C++ Program. Classes and Objects: Classes, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members, When Constructors and Destructors are Executed, The Scope Resolution Operator, Passing Objects to functions, Returning Objects, Object Assignment

(5 Hours)

Module – 2

Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, The this Pointer, Pointers to derived types, Pointers to class members. **Functions Overloading, Copy Constructors:** Functions Overloading, Overloading Constructor Functions. Copy Constructors, Default Function Arguments, Function Overloading and Ambiguity.

(6 Hours)

Module – 3

Operator Overloading: Creating a Member Operator Function, Operator Overloading Using a Friend Function, **Overloading new and delete Inheritance:** Base-Class Access Control, Inheritance and Protected Members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes

(6 Hours)

	Module – 4
	Virtual Functions and Polymorphism: Virtual Functions, The Virtual Attribute is Inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early vs Late Binding. **Templates**: Generic Functions, Applying Generic Functions, Generic Classes. The type name and export Keywords. The Power of Templates **(5 Hours)**
	Module – 5
	Exception Handling: Exception Handling Fundamentals, Handling Derived-Class Exceptions, Exception Handling Options, Applying Exception Handling. **The C++ I/O System Basics:** C++ Streams, The C++ Classes, Formatted I/O File I/O: and File Classes, Opening and Closing a File, Reading and Writing Text Files, Detecting EOF, **(6 Hours)**

Course Outcomes:
The students will be able to:

CO1: Illustrate the basic concepts of object-oriented programming.

CO2: Design appropriate classes for the given real world scenario.

CO3: Apply the knowledge of compile-time / run-time polymorphism to solve the given problem

CO4: Use the knowledge of inheritance for developing optimized solutions

CO5: Apply the concepts of templates and exception handling for the given problem

CO6: Use the concepts of input output streams for file operations.

Practical Component

PART – A

FIXED SET OF EXPERIMENTS

1	You are building a feature for an e-commerce platform that displays product prices. Write a C++ program that accepts a list of product prices and displays them sorted both in ascending (low to high) and descending (high to low) order, allowing customers to choose how they want to view the prices." (Use basic programming concepts like looping constructs for menu driven programming, arrays and sorting logic etc.)
2	As part of a student management system, you are tasked with designing a module to generate student performance reports. Create a C++ program using classes that captures a student's name, roll number, and marks in three subjects. The program should then calculate and display the student's total score along with their details. (Use C++ concepts like classes, constructors and methods etc.)
3	You are developing a contact management application where each contact contains details such as name, phone number, and email address. To ensure safe and accurate duplication of contact records (e.g., for backup or editing), implement a C++ class Contact that: a. Includes a copy constructor to properly copy all data members from one contact object to another. b. Also includes a destructor to manage clean-up when a contact object is destroyed (e.g., to release memory or display a message indicating the object is being deleted). Demonstrate the creation of an original contact and a copy using the copy constructor, display their contents, and show how the destructor is automatically invoked when objects go out of scope. (Use C++ concepts like classes, constructors, copy constructor, destructor etc.)

4	Develop a loan eligibility evaluation system for a bank. The system has two classes: Customer – contains private data members such as name, account balance, and credit score. Loan – is responsible for evaluating whether the customer is eligible for a loan based on specific criteria (e.g., balance ≥ ₹50,000 and credit score ≥ 750 out of 1000). Since the Loan class should not directly access the private members of the Customer class, implement a friend function named checkEligibility() that can access the private data of Customer and evaluate the eligibility. (Use C++ concepts like classes, constructor, Friend functions etc.)
5	You are developing a banking application that enables customers to manage their accounts efficiently. As part of the system implement the following functionality: a. Implement function overloading to perform addition of both integer-based amounts (e.g., ₹500 + ₹200) and floating-point values (e.g., ₹1000.75 + ₹499.25), ensuring accuracy across transaction types like deposits and interest calculations. b. Use operator overloading to redefine the unary minus (-) operator, allowing quick reversal of transaction values — for example, converting a credit transaction into a debit during a refund or correction. (Use concepts like classes, function overloading and operator overloading etc.)
6	You are designing a modular calculator system where arithmetic functionalities are separated into logical units. One class provides addition functionality, another provides subtraction, and a third class inherits from both to perform a full arithmetic operation on two numbers. Implement a C++ program using multiple inheritances to demonstrate this system. (Use concepts like classes, constructors, multiple inheritances etc.)
7	"You're working on a scientific computation module where different values—such as alpha, beta, and gamma—represent coefficients in a formula. These values come from different sources: a base class initializes alpha and beta, while the derived class introduces gamma. Write a C++ program using constructors in derived classes to properly initialize and display all three values, showcasing inheritance and constructor chaining." (Use concepts like classes, constructors, inheritance and constructor chaining etc.)

PART – B
OPEN ENDED EXPERIMENTS

Students should develop a program for the given scenario by the course teacher on the following concepts.
1. File operation in C++
2. Built-in & User Defined Exception Handling

Textbooks:
1. Herbert schildt, The Complete Reference C++, 4 th edition, TMH, 2005.

References:
1. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill
2. Education Pvt.Ltd., Sixth Edition 2016.
3. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.
4. A K Sharma , "Object Oriented Programming with C++", Pearson Education, 2014.

Activity Based Learning (Suggested Activities in Class)/ Project Based Learning :
- Group Assignment to develop small projects and demonstrate using C++

Lab CIE (30 marks) –Rubrics used for Continuous Evaluation in every lab session (30M scaled down to 10)

Parameter	Allocated Marks	LOW	MEDIUM	HIGH
Execution	18	The given program was coded but not executed in the lab session	The given program was coded ,debugged and executed in the lab session but results are not up to the expectation.	The given program was coded, debugged and executed in the lab session appropriately. (with any additions / modifications given by course coordinator)
		0-5 Marks	**6-15 Marks**	**16-18 Marks**
Record writing	09 Attendance: 2 Marks)	he record was not submitted in the lab session	The record was submitted in the lab session but was incomplete (no Algorithm / wrong Algorithm & no Flowchart / wrong Flowchart)	Completed record was submitted in the lab session. (Tracing of code with sample inputs & proper indication of graphs, tables, figures etc)
		0 Marks	**1-5 Marks**	**6 -7 Marks**
Viva-voce	03	The student did not answer any viva questions asked	The student answered few viva questions asked	The student answered all viva questions asked (Tracing for different data / formula deriving etc)
		0 Marks	**1-2 Marks**	**3 Marks**

BMS Institute of Technology and Management
Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
SEMESTER – III
(Common to all branches)

Social Connect and Responsibility
(Effective for 2022 Scheme)

Course Code	BSCK307	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26 Hours	Exam Hours	-
Credits	01 - Credit		

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

Social Connect & Responsibility –All Modules Activity Based Learning

Module-1
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature   -   –   Objectives,   Visit,   case   study,   report,   outcomes.
(04 Hours)

Module-2
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes.
(05 Hours)

Module-3
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes.
(06 Hours)

Module-4
Water conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes. **(06 Hours)**

Module-5
Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes. **(05 Hours)**

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

CO1: Communicate and connect to the surrounding.

CO2: Create a responsible connection with society.

CO3: Involve in the community in general in which they work.

CO4: Notice the needs and problems of the community and involve them in problem –solving.

CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.

CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

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

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

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

Duration: A total of 26 hours engagement per semester is required for the 3rd semester of the B.E./B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors have to design the evaluation system as per VTU guidelines of scheme & syllabus.

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

> Excellent: 80 to 100
> Good: 60 to 79
> Satisfactory: 40 to 59 Unsatisfactory
> and fail: <39

Special Note: **NO Semester End Examination (SEE) – Completely Practical and activities-based evaluation**

Pedagogy – Guidelines: It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.						
Sl No	Topic	Group size	Location	Activity execution	Reporting	Evaluation of the Topic
1.	**Plantation and adoption of a tree**	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc	Site selection /Proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
2.	**Heritage walk and crafts corner**	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc	Site selection /Proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
3.	**Organic farming and waste management**	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
4.	**Water conservation & conservation techniques**	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc	site selection / proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty

5.	Food walk: Practices in society	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study-based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submi as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	CIE – 100%	
Field Visit, Plan, Discussion	10 Marks	• Implementation strategies of the project (NSS work).
Commencement of activities and its progress	20 Marks	• The last report should be signed by NSS Officer, the HOD and principal.
Case study-based Assessment Individual performance with report	20 Marks	• At last report should be evaluate the NSS officer of the institute.
Sector wise study & its consolidation 5*5= 25	25 Marks	• Finally, the consolidated mark sheet should be sent to university
Video based seminar for 10 minutes by each student at the end of semester with Report. **Activities 1 to 5, 5*5 = 25**	25 Marks	and also to be m available at LIC visit.
Total marks for the course in each semester	**100 Marks**	

For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.

Students should present the progress of the activities as per the schedule in the prescribed practical session in the field.
There should be positive progress in the vertical order for the benefit of society in general through activities.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS)
SEMESTER - III

Data Analytics with Excel (0:0:2) 1
(Effective from the academic year 2023-24)

Course Code	**BCB358A**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Total Number of Contact Hours	**26Hours**	Exam Hours	**03**
Examination Type		**Practical**	

Course Objectives:

This course enables students to:
1. To Apply analysis techniques to datasets in Excel
2. Learn how to use Pivot Tables and Pivot Charts to streamline your workflow in Excel
3. Understand and Identify the principles of data analysis
4. Become adept at using Excel functions and techniques for analysis
5. Build presentation ready dashboards in Excel

Sl. No	Programs List
1	Getting Started with Excel: Creation of spread sheets, Insertion of rows and columns, Drag & Fill, use of Aggregate functions.
2	Working with Data : Importing data, Data Entry & Manipulation, Sorting & Filtering.
3	Working with Data: Data Validation, Pivot Tables & Pivot Charts.
4	Data Analysis Process: Conditional Formatting, What-If Analysis, Data Tables, Charts & Graphs.
5	Cleaning Data with Text Functions: use of UPPER and LOWER, TRIM function, Concatenate.
6	Cleaning Data Containing Date and Time Values: use of DATEVALUE function, DATEADD and DATEDIF, TIMEVALUE functions.
7	Conditional Formatting: formatting, parsing, and highlighting data in spreadsheets during data analysis.
8	Working with Multiple Sheets: work with multiple sheets within a workbook is crucial for organizing and managing data, perform complex calculations and create comprehensive reports.
9	Create worksheet with following fields: Empno, Ename, Basic Pay(BP), Travelling Allowance(TA), Dearness Allowance(DA), House Rent Allowance(HRA), Income Tax(IT), Provident Fund(PF), Net Pay(NP). Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.
10	Create worksheet on Inventory Management: Sheet should contain Product code, Product name, Product type, MRP, Cost after % of discount, Date of purchase. Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.

Course Outcomes:

The student should be able to:

- **CO1:** Choose functions and productivity tools to assist in developing worksheets.
- **CO2:** Create and manipulate data lists using Outline and PivotTables in Microsoft Excel.
- **CO3:** Utilize Consolidation features to summarize and report results from multiple worksheets.

Textbooks

1. Berk & Carey - Data Analysis with Microsoft® Excel: Updated for Office 2007®, Third Edition, © 2010 Brooks/Cole, Cengage Learning, ISBN-13: 978-0-495-39178-4
2. Wayne L. Winston - Microsoft Excel 2019: Data Analysis And Business Modelling, PHI, ISBN: 9789389347180
3. Aryan Gupta - Data Analysis in Excel: The Best Guide.
   (https://www.simplilearn.com/tutorials/excel-tutorial/data-analysis-excel)

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER – III

Data Analytics with R (0:0:2) 1
(Effective from the academic year 2023 -24)

Course Code	**BCB358B**	CIE Marks	**50**
Teaching Hours/Week (L: T:P)	**0:0:2**	SEE Marks	**50**
Total Number of Contact Hours	**26hrs**	Exam Hours	**3 Hours**
Examination Type	**Theory**		

Course Objectives:
This course will enable students to:
1. To explore and understand how R and R Studio interactive environment.
2. To understand the different data Structures, data types in R.
3. To learn and practice programming techniques using R programming.
4. To import data into R from various data sources and generate visualizations.
5. To draw insights from datasets using data analytics techniques.

Preamble: R analytics is data analytics using R programming language, an open-source language used for statistical computing or graphics. This programming language is often used in statistical analysis and data mining It can be used for analytics to identify patterns and build practical models.

Si. No	Program
1	Demonstrate the steps for installation of R and R Studio. Perform the following: a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors, matrices and arrays **Suggested Reading** – Text Book 1 – Chapter 1 (What is R, Installing R, Choosing an IDE – RStudio, How to Get Help in R, Installing Extra Related Software), Chapter 2 (Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors), Chapter 3 (Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables)
2	Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: a. Profit for each month. b. Profit after tax for each month (Tax Rate is 30%). c. Profit margin for each month equals to profit after tax divided by revenue. d. Good Months – where the profit after tax was greater than the mean for the year. e. Bad Months – where the profit after tax was less than the mean for the year. f. The best month – where the profit after tax was max for the year. g. The worst month – where the profit after tax was min for the year. Note: a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with $0.01 precision, but need to be presented in Units of $1000 (i.e 1k) with no decimal points

	c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data. **Suggested Reading** – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)
3	Develop a program to create two 3 X 3 matrices A and B and perform the following operations a)Transpose of the matrix b) addition c) subtraction d) multiplication **Suggested Reading** – Text Book 1 – Chapter 4 (Matrices and Arrays – Array Arithmetic)
4	Develop a program to find the factorial of given number using recursive function calls. **Suggested Reading** – Reference Book 1 – Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops),Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)
5	Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes. **Suggested Reading** – Reference Book 1 - Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)
6	The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to: a) Find the Pearson and Spearman correlation coefficients. Are they similar? b) Plot the data using the plot command. c) Plot the logarithm (log) of each variable and see if that makes a difference. **Suggested Reading** – Text Book 1 –Chapter 12 – (Built-in Datasets) Chapter 14 – (Scatterplots) Reference Book 2 – 13.2.5 (Covariance and Correlation)
7	Develop R program to create a Data Frame with following details and do the following operations. | itemCode	itemCategory	itemPrice
---	---	---
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800	 a) Subset the Data frame and display the details of only those items whose price is greater than or equalto 350. b) Subset the Data frame and display only the items where the category is either "Office Supplies" or"Desktop Supplies" c) Create another Data Frame called "item-details" with three different fields itemCode, ItemQtyonHand and ItemReorderLvl and merge the two frames **Suggested Reading** –Textbook 1: Chapter 5 (Lists and Data Frames)
8	Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements. a) Assigning names, using the air quality data set. b) Change colors of the Histogram c) Remove Axis and Add labels to Histogram d) Change Axis limits of a Histogram e) Add Density curve to the histogram **Suggested Reading** –Reference Book 2 – Chapter 7 (7.4 – The ggplot2 Package), Chapter 24 (Smoothing and Shading)
9	Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name,

	salary, start_date, dept. Import into R and do the following analysis.
	a) Find the total number rows & columns
	b) Find the maximum salary
	c) Retrieve the details of the employee with maximum salary
	d) Retrieve all the employees working in the IT Department.
	e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv"
	Suggested Reading – Text Book 1 – Chapter 12(CSV and Tab Delimited Files)
10	Using the built in dataset mtcars which is a popular dataset consisting ofthe design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axleratio, [6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors
	Develop R program, to solve the following:
	a) What is the total number of observations and variables in the dataset?
	b) Find the car with the largest hp and the least hp using suitable functions
	c) Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness?
	d) What is the average difference of gross horse power(hp) between automobiles with 3 and 4 number of cylinders(cyl)? Also determine the difference in their standard deviations.
	e) Which pair of variables has the highest Pearson correlation?
	References (Web links):
	1. https://cran.r-project.org/web/packages/explore/vignettes/explore_mtcars.html
	2. https://www.w3schools.com/r/r_stat_data_set.asp
	3. https://rpubs.com/BillB/217355
11	Demonstrate the progression of salary with years of experience using a suitable data set (You can create your own dataset). Plot the graph visualizing the best fit line on the plot of the given data points. Plot a curve of Actual Values vs. Predicted values to show their correlation and performance of the model. Interpret the meaning of the slope and y-intercept of the line with respect to the given data. Implement using lm function. Save the graphs and coefficients in files. Attach the predicted values of salaries as a new column to the original data set and save the data as a new CSV file.
	Suggested Reading – Reference Book 2 – Chapter 20 (General Concepts, Statistical Inference, Prediction)

Course outcomes:

The students will be able to:

CO1: Explain the fundamental syntax of R data types, expressions and the usage of the R-StudioIDE.

CO2: Develop a program in R with programming constructs: conditionals, looping and functions.

CO3: Apply the list and data frame structure of the R programming language.

CO4: Use visualization packages and file handlers for data analysis.

Textbooks

1. Cotton, R. (2013). Learning R: A Step by Step Function Guide to Data Analysis. 1st ed. O'Reilly Media Inc.

References

1. Jones, O., Maillardet. R. and Robinson, A. Using R. Chapman & Hall/CRC, The R Series. (2014). Introduction to Scientific Programming and Simulation

2. Davies, T.M. (2016) The Book of R: A First Course in Programming and Statistics. No Starch Press

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS)

SEMESTER - III

Data Visualization using Tableau and Power BI (0:0:2) 1

(Effective from the academic year 2023-24)

Course Code	**BCB358C**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Total Number of Contact Hours	**26**	Exam Hours	**02**
Examination Nature	**Practical**		

Course Objectives:

This course will enable students to:
1. To understand the fundamentals of data visualization and the role of visual analytics.
2. To develop proficiency in creating various types of visualizations and dashboards using Tableau.
3. To build skills in data modeling, visualization, and reporting with Power BI.
4. To enable students to design and implement interactive dashboards that facilitate data-driven decision-making.

Preamble:

This course aims to provide students with the skills and knowledge required to create impactful data visualizations using Tableau and Power BI. It covers the essentials from introductory concepts to advanced techniques, enabling students to transform data into actionable insights through interactive and visually appealing dashboards.

Sl. No	Experiments
1	**Introduction to Data Visualization:** Create a simple bar chart using a provided dataset in both Tableau and Power BI. Focus on understanding how to connect to data sources and basic visualization principles.
2	**Getting Started with Tableau:** Connect Tableau to a sample Excel dataset and create a line chart to visualize trends over time.
3	**Getting Started with Tableau:** Build a dashboard in Tableau that includes a bar chart, a line chart, and a scatter plot, all linked through interactive filters.
4	**Advanced Tableau Techniques** Create a heat map in Tableau to show data density and distribution across geographical regions using a provided dataset.
5	Develop a Tableau dashboard with calculated fields and parameters to allow dynamic user input and view changes.
6	Use Tableau's storytelling feature to create a presentation that guides viewers through different insights in the dataset.
7	**Getting Started with Power BI:** Import a dataset into Power BI and create a pie chart to represent the distribution of categories within the data.
8	Construct a data model in Power BI by establishing relationships between different tables and creating a basic report.
9	Create a Power BI dashboard with bar charts, line graphs, and KPIs, incorporating slicers to enable interactive filtering.
10	**Advanced Power BI Techniques:** Develop a complex Power BI report using DAX to create calculated columns and measures,

	showcasing advanced analytical capabilities.
11	Utilize custom visuals in Power BI to create a more engaging and informative dashboard, focusing on map visualizations and unique chart types.
12	Publish a Power BI report to the Power BI Service, configure sharing settings, and create a shared workspace for collaboration.

Course outcomes:

The students will be able to:

CO1: Apply the principles of data visualization to create effective visualizations.
CO2: Use Tableau to develop a wide range of visualizations and interactive dashboards.
CO3: Utilize Power BI for comprehensive data integration, visualization, and reporting.
CO4: Analyze and interpret data to generate meaningful business insights.

Textbooks	
1.	Mastering Microsoft Power BI by Brett Powell
2	Tableau Your Data! by Daniel G. Murray
3	Data Visualization: A Practical Introduction by Kieran Healy

B.E COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS) applicable for 2022 Scheme
SEMESTER –III/ IV(AEC course)

BUSINESS COMMUNICATION-1(1:0:0) 1
(Effective from the academic year 2024-25)

Course Code		BCB358D	CIE Marks	50
Teaching Hours/Week (L:T:P)		1:0:0	SEE Marks	50
Total Number of Contact Hours		16	Exam Hours	1

Course Objectives:

This course will enable students to: (List as per the requirement of your course)
1. Enhance proficiency and competencies in verbal and non- verbal communication skills with a holistic long-term perspective
2. Develop technical communication skills
3. Guide the participants to manage cross cultural communication
4. Address contemporary skills, issues and concepts

Preamble: This course introduces the fundamental principles of business communication and provides the opportunity to distinguish between business communication and personal/social communication. The course is designed to impart a basic understanding of written business communication, including letters, reports, presentations and email and valuable insights into listening and non -verbal communication. Every skill gained from this course will aid the learners in developing complete confidence to communicate professionally with different audiences

Module – 1

Business Communication components, Types, formal communication network, Work team communication, variables, goal, conflict resolution, nonverbal communication, Cross cultural communication, Business meetings, Business Etiquette.

Text Book :1   **04 Hours**

Module – 2

Understanding Corporate Communication, Employee Communication, Managing Government Relations, Writing for Media and Media Relations.

Text Book :1   **03 Hours**

Module – 3

Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.

Text Book: 1   **03 Hours**

Module – 4

Report writing: Characterizing & business reports, Types and forms &; reports,

Text Book:1   **03 Hours**

Module – 5

Business Presentation: Written and oral presentation, work, team presentation, Delivering the business presentation visual aids, slides, electronic presentation, hand-outs, delivering the presentation.

Text Book:1   **03 Hours**

Course Outcomes:

The students will be able to

CO1: Communicate with more clarity that would facilitate the organizational work process.

CO2: Break the barriers and help in the process of earning greater commitment among stakeholders to goal achievement.

CO3: Handle all sorts of organizational communications, within and beyond.

CO4: Demonstrate cross - cultural skills in a trans-national business environment

Text Books:

1. Scot Ober, Contemporary business communication, Biztantra, 2014, ISBN-10: 9780198061847

Reference Books:

1.Lesiler &Flat lay, Basic Business communication, Tata Mc Graw Hill, 2010, ISBN-10: 9780072537536

Alternate Assessment Tools (AATs) suggested:

- **Activity Based Learning**

B.E COMPUTER SCIENCE AND BUSINESS SYSTEMS
Choice Based Credit System (CBCS)
SEMESTER – III

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

Course Code	BENGDIP1	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. Familiarise with basic English Grammar and Communication Skills in general.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills
3. Enhance English vocabulary and language proficiency for better communication skills.
4. Learn about Techniques of Information Transfer through presentation

Module – 1: Fundamentals of Communication

Introduction, Communication-an overview, Definition of communication, Features of successful professional communication, Importance of communication, Purpose of professional communication, Rule of critical and creative thinking in effective communication, Role of emotions in communication, Role of Inter-Cultural Communication, Different forms of communication, Communication network in an organization, Barriers to communication, Some remedies.

Non-verbal communication: Introduction, Body language, Paralinguistic features, Proxemics/ Space distance, Haptics.

4 Hours

Module – 2: Grammar Essentials and Phonetics

Grammar: Essentials and Applications

Introduction, Parts of Speech, Articles and Prepositions, Modals, Sentences and their types, Subject-verb, Concord, using tenses, Moods of Verbs, Active passive voice, Direct indirect speech, Clause and its types, Using non-Finites.

Basic of Phonetics: Introduction, Reasons for incorrect pronunciations, received pronunciation, Misconceptions about sounds, Transcriptions, Problems of Indian English, Syllables, Word stress, How to transcribe, Weak forms, Intonation and rhythm, Difference between British American and Indian spoken English.

6 Hours

Module – 3: Reading and Listening Skills

Reading skills: Introduction, need for developing efficient reading skills, Benefits of effective reading, Speed of reading, four basic steps to effective reading, overcoming common obstacles, Types, Approaches to efficient reading, Tips for effective reading, employing different reading skills, Understanding the authors point of view, Identifying the central idea, inferring lexical and contextual meaning, employing discourse analysis, Worked out passages.

Listening skills: Introduction, Listening is an art, Listening vs hearing, Poor vs effective listening, Advantages of good listening, Process of listening, Types of listening. Intensive listening vs extensive listening, Barriers to effective listening, five steps of active listening techniques for effective listening, Listening and not taking. **8 Hours**

Module – 4: Paragraphs and Precis Writing
Introduction, precise, Summary, Abstract, Synopsis, Paraphrasing, Art of condensation, Some working principles, Seven step ladder to writing an effective precis, Writing precise for given passages, Structure of a paragraph, Construction of a paragraph, Features of a paragraph, Descriptive writing techniques, Augmentative paragraph, Analytical paragraph.
4 hours
Module – 5: Professional Presentations and Writing
Professional Presentations: Introduction, combating stage fright, preparing PPT slides, Describing objects, Situations and people, Individual and group presentations, Delivering JAMs **Essays, Letters, Resumes:** Introduction, Types of essays, Characteristic features of an essay, Stages in essay writing, Components comprising an essay, Essay writing-guiding principles, Business letters and resumes- Importance, Elements of structure, Layout. Business letters- Elements of style, Types of business letters, Resume preparation.
4 Hours

Course Outcomes: The students will be able to:
1. Understand and apply basic English grammar for effective communication.
2. Identify the nuances of phonetics, intonation, and enhance pronunciation skills.
3. Understand and use all types of English vocabulary and language proficiency.
4. Enhance their knowledge about techniques of information transfer through presentations.

Textbooks
  1. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford Publications, 3rd Edition, 2015
  2. Sanjay Kumar and Pushpa Lata, Communication Skills, Oxford University Press,
  3. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

References
  1. Gajendra Singh Chauhan, Technical Communication Cengage Learning India Pvt Limited, Latest Revised Edition, 2019
  2. Michael Swan, Practical English Usage, Oxford University Press, 2016
  3. N.P.Sudharshana and C.Savitha, English for Engineers, Cambridge University Press, 2018

Department of Humanities and Social Sciences				
B.E. Computer Science and Business Systems				
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 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 resultsand enhance their enrolment in Higher/ technical/ vocational education.

(06 Hours)

Module 4

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
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.

Department of Humanities and Social Sciences
B.E. Computer Science and Business Systems
Choice Based Credit System (CBCS)
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 studenthas 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, "Textbook 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, ics 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).

Department of Humanities and Social Sciences
B.E. Computer Science and Business Systems
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 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:
CO1: Understand the requirement of practicing yoga in their day-to-day life.
CO2: Apply the yogic postures in therapy of psychosomatic diseases
CO3: Train themselves to have a focussed, joyful and peaceful life.
CO4: Demonstrate the fitness of Physical, Mental and Spiritual practices.
CO5: 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

Department of Humanities and Social Sciences
B.E. Computer Science and Business Systems
Choice Based Credit System (CBCS)
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 ofsettings.

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, JathiSwara, 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 (AffectiveDomain)

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 inthree 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: APractical Guide", Tranquebar 2018.
2. R. Rangaramanuja Ayyangar,"History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, "TheStory 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.

<table>
<tr><td colspan="4" align="center">**Department of Humanities and Social Sciences**
B.E. Computer Science and Business Systems
Choice Based Credit System (CBCS)
SEMESTER III to VI</td></tr>
<tr><td colspan="4" align="center">NCC
(Common to all Branches)
(Effective for the 2022 scheme)</td></tr>
<tr><td>Course Code</td><td>**BNCK359/459/559/659**</td><td>CIE Marks</td><td>100</td></tr>
<tr><td>Teaching Hours/Week (L:T:P:S)</td><td>0:0:2:0</td><td>SEE Marks</td><td>-</td></tr>
<tr><td>Total Number of Contact Hours</td><td>26</td><td>Exam Hours</td><td>-</td></tr>
<tr><td colspan="4" align="center">Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of degree)</td></tr>
</table>

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", Publishers, 1990.