BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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

Yelahanka, Bengaluru 560119

Bachelor of Engineering

Department of Computer Science and Business Systems

V Semester Scheme & Syllabus
2022 Scheme
Effective from the AY 2025-26

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:

INTEGRATED PROFESSIONAL COMPETENCE COURSE (IPCC) COURSES
4 OR 3 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 - Internal Assessment (IA) Tests	CIE – Test 1 (1.5 hr)	40	20	-	The sum of the two internal assessment tests will be **80 Marks** and the same shall be scaled down to **20 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	10	-	Any one assessment method can be used from the list appended below.
	Total CIE Theory			**30**	**12**	
Practical Component	CIE - Practical		30	10	-	Each laboratory experiment is to be

					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 – 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 **A**IDED **E**NGINEERING **D**RAWING (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

Dean - AA 21/09/24

21/9/2024

Principal

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

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Computer Science and Business Systems

Scheme of Teaching and Examinations – 2022 Scheme

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2025-26 onwards)

V Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credits Distribution					Examination				Contact Hours/week
					L	T	P	S	Total	CIE Marks	SEE Marks	Total Marks	SEE Duration (H)	
1	HSMC	BCB501	Engineering Economics and Cost Management	TD: CSE/CSBS PSB: CSE/ISE/CSBS	3	0	0		3	50	50	100	3	3
2	IPCC	BCS502	Computer Networks		3	0	2		4	50	50	100	3	5
3	PCC	BCS503	Theory of Computation		4	0	0		4	50	50	100	3	4
4	PCCL	BCBL504	Data Analysis and Design Pattern		0	0	2		1	50	50	100	3	2
5	PEC	BCB505x	Professional Elective Course I		3	0	0		3	50	50	100	3	3
6	PW	BCB506	Mini Project		0	0	6		3	50	50	100	3	6
7	AEC	BRMK507	Research Methodology and IPR	Any Department	2	0	0		2	50	50	100	3	2
8	MC	BESK508	Environmental Studies	TD: CV PSB: CV	1	0	0		1	50	50	100	1	1
9	NCMC	BNSK509	National Service Scheme (NSS)	NSS Coordinator	0	0	0		0	100	-	100	-	2
		BPEK509	Physical Education (Sports and Athletics)	PED										
		BYOK509	Yoga	Yoga Teacher										
		BNCK509	National Cadet Corps (NCC)	NCC officer										
		BMUK509	Music	Music Teacher										
TOTAL									**21**	**500**	**400**	**900**	**-**	

HSMC: Humanities, Social Sciences and Management Course, **IPCC**: Integrated Professional Core Course, **PCC**: Professional Core Courses, **PCCL**: Professional Core Course laboratory, **PEC:** Professional Elective Course, **PW:** Project Work, **AEC**: Ability Enhancement Course, **MC:** Mandatory Course, **NCMC**: Non Credit Mandatory Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

Professional Elective Course I			
Course Code	**Course Name**	**Course Code**	**Course Name**
BCB505A	Software Project Management and Design Pattern	**BCB505C**	Fundamentals of Marketing and Research
BCB505B	Real-Time Operating Systems - QNX	**BCB505D**	Banking and Financial Services

Integrated Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's 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.

National Service Scheme /Physical Education/Yoga/NCC/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), Yoga (YOG), National Cadet Corps (NCC) and Music with the concerned coordinator of the course during the beginning of each semester starting from III semester to VII semester. In every semester, students should choose any one mandatory course among the available 5 courses without repeating the course again. Activities shall be carried out in each of the semesters from 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. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Mini Project: The Mini Project Work is a part of the curriculum in the pre-final year. Mini Project is a course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications. Based on the ability/abilities of the student/s and recommendations of the mentor, a Mini- project can be assigned to a group having not more than 4 students. A comprehensive report is to be prepared after completion of the project work.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

ENGINEERING ECONOMICS AND COST MANAGEMENT (3:0:0:0) 3

(Effective from the academic year 2025-26)

Course Code	BCB501	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. To understand the fundamental principles of engineering economics.
2. To learn practical techniques for making informed financial decisions.
3. To analyze and optimize production processes for better efficiency.
4. To learn methods for managing costs, depreciation, and taxation in projects.
5. To understand the impact of inflation on engineering project decisions.

Module – 1

Introduction: Concept of Engineering Economics, Definition and Scope of Economics, Principles of Engineering economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy, New Product Development, Law of Demand and Supply, Law of returns, Economics and Business Environment. Professional Ethics in decision making. **(08 Hours)**

Module – 2

Theory of Production: Production Function-Concepts, Factors of Production, Production Function, Iso-Product Curves, Economies of Scale, Economics of Inventory, Economics of System Quality-Metrics, Factors and interpretation, Theory of Constraints, Systems Engineering, Lean Metrics, Overall Cost of Quality, Evaluating Production operations and Business Risk Management, Make or Buy Decisions-Economic Analysis. **(08 Hours)**

Module – 3

Costing Systems: Engineering Costs- Fixed, Variable, Marginal, Average, Sunk, Opportunity, Recurring, Non-recurring and Life Cycle Costs. Elements of Cost, Cost flow in a Manufacturing, Value Analysis and Value Engineering Process, Break Even Analysis, P/V ratio, Margin of Safety, Learning Curve Concept. **(08 Hours)**

Module – 4

Analysis of Projects: Introduction, the cost of money, Economic Equivalence, Present worth Analysis, Annual Equivalence Analysis, Future worth Analysis, Pay-back period analysis, Rate of Return Analysis, Benefit-Cost Analysis, Decision making under risk-EMV Methodology, Capitalized Cost Analysis. **(08 Hours)**

Module – 5

Depreciation, Inflation & Business Cycle: Concept, Depreciation, Depletion, Amortization, Causes of Depreciation, Basic methods of computing depreciation- Straight Line Method, Declining Balance Method, Sum-of-the-Year Digits and Service Output Method; Taxes, Concept of Inflation, Overview of National Income. **(08 Hours)**

Course Outcomes:

The students will be able to:

CO1: Apply economic principles and methods to analyze and solve engineering decision-making problems, understanding the interplay between engineering and economics.

CO2: Calculate and interpret various financial metrics, including present worth, future worth, and equivalent annual worth, to compare and evaluate engineering projects with different life spans and cash flows.

CO3: Identify key production functions, costing systems, and cost behaviors, which will enable them to understand and apply appropriate costing techniques in different scenarios.

CO4: Analyse the impact of inflation, taxation and depreciation on an engineering project.

Textbooks

1. Samuelson, Paul.A and William Nordhaus, "Economics", 2019, 20th Edition, McGraw Hill Publishers, New Delhi .
2. Microeconomics,Pindyck, Robert S., and Daniel L. Rubinfeld.
3. J. L. Riggs, Engineering Economics, Tata McGraw Hill, New Delhi.

Reference Books

1. Sullivan G William, Elin M Wicks and C. Patrick Koelling, "Engineering Economy", 2018, 17th Edition, Pearson Education.
2. Perloff, Jeffrey M, "Microeconomics", 2019, 7th Edition, Pearson Education.
3. Leland Blank & Anthony Tarquin, "Basics of Engineering Economy" , McGraw Hill Publication (India) Private Limited.
4. R Panneerselvam , "Engineering Economics", 2012, PHI Learning Private Limited.
5. Zahid A Khan, Arshad N Siddiquee, Brajesh Kumar, "Engineering Economy" ,2012, First Edition, Pearson Education.

Alternate Assessment Tools (AATs) suggested:

MOOC Course of duration minimum 4-8 weeks/25 hours.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

COMPUTER NETWORKS (3:0:2:0) 4

(Effective from the academic year 2025-26)

Course Code	BCS502	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Number of Contact Hours	40+12(Practical)	Exam Hours	3

Course Objectives:

This course will enable students to: (List as per the requirement of your course)

1. Understand fundamentals of data communication networks
2. Explain routers, IP and Routing Algorithms in network layer
3. Discuss transport layer services and understand UDP and TCP protocols
4. Demonstration of application layer protocols

Preamble: This course provides an outline of network functions by introducing data communication and network concepts such as characteristics, functions, benefits, metrics, and attributes that describe network features and performance. In broad sense, Computer Networks are bringing fundamental transformation in our society from an industry economy to an information economy. Data Communications and Networking is an integral part of contemporary technologies and hence gained significance in engineering education. With constant upgrade in knowledge and skills Computer networking can lead to an exciting and rewarding career including the potential job opportunities such as Network Specialists, Network Technicians, Network administrators, Network analysts and Network solution Architects.

Module – 1

Data Communications: Data Communications Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Physical Layer: Data and Signals, Digital Signals, Transmission Impairment, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), PCM

Text book1 :Ch:1,2,3 (08 Hours)

Module – 2

Data Link Layer: Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Data link layer protocols, Stop and Wait, Go-Back-N, Selective repeat, Point to Point protocol (Framing, Transition phases only). Media Access control: Random Access, Controlled Access and Channelization

Text book 1Ch: 9,10,11 (08 Hours)

Module – 3

IPV4 Addresses, Internet Protocols: IPv4 and IPv6, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm

Text book 1: Chapter 18.4,18.4.1,18.4.2,18.4.3,19.1,19.1.1
TextBook2: Chapter 4.4.4,4.5,4.5.1,4.5.2 (08 Hours)

Module – 4

Introduction to Transport layer services, Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum, Connection-Oriented Transport TCP: TCP Segment Structure, Round- Trip
Time Estimation and Timeout, TCP Connection Management, Principles of Congestion control, TCP Congestion Control

Text book 2: 3.1,3.3,3.5.2,3.5.3,3.5.6 (08 Hours)

Module – 5

Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Socket Programming

Text Book2: 2.1.1,2.1.2,2.1.5,2.2.1-,2.2.3, 2.3.1,2.4.12.4.3,2.4.4, 2.5.1-2.5.3,2.7 (08 Hours)

Practical components for IPCC (add this only for IPCC courses)

Sl. No.	PART A FIXED SET OF EXPERIMENTS
1.	Implementation of Cyclic Redundancy Check for error correction and detection**.**
2.	Write a program for congestion control using leaky bucket algorithm
3.	Write a program to find the shortest path between vertices using bellman-ford algorithm
4.	Implement a client Server program using TCP and UDP
5.	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped
6.	Simulate a four-node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents, changing the parameter and determine the number of packets sent by TCP / UDP
7.	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination
8.	Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

PART- B
OPEN ENDED EXPERIMENTS

- Flow control/ congestion control protocols using NS2/JAVA.
- Implement Routing Protocols of network layer.

Course Outcomes:

The students will be able to:

CO1: Apply computer networking concepts to perform data communication between different entities.
CO2: Analyze different layer services and protocols.
CO3: Analyze the algorithms to provide congestion control, routing and processes communication.
CO4: Demonstrate algorithms for different concepts of computer networks.

Textbooks:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth Edition, Pearson,2017.

References:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 6th Edition, Elsevier, 2007.

Alternate Assessment Tools (AATs) suggested:

- Demonstration and survey on network architecture of various organizations

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

THEORY OF COMPUTATION (4:0:0:0) 4

(Effective from the academic year 2025-26)

Course Code	BCS503	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	4:0:0:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Apply the core concepts in Automata and Theory of Computation
2. Design Grammars for context free languages
3. Prove theorems in automata theory using suitable properties
4. Design PDA and Turing machines for suitable languages

Preamble:

In this course, we delve into the elegant theories and intricate models that define what is computationally possible and impossible. From finite automata to Turing machines, from regular languages to undecidability, we explore the boundaries and capabilities of computation itself.

Module – 1

Introduction to Finite Automata:

Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. Finite automata with Epsilon-transitions.

Text book : 1.5, 2.2, 2.3, 2.5 **(10 hours)**

Module – 2

Regular expressions, Properties of Regular Languages: Finite Automata and Regular Expressions; Applications of Regular Expressions. Kleene's theorem. **Regular languages:** Proving languages not to be regular languages; Closure properties of regular languages; Equivalence and minimization of automata.

Text Book : 3.1, 3.2, 3.3, 4.1, 4.2, 4.4 **(10 hours)**

Module – 3

Context-Free Grammars and Languages: Context–free grammars; Writing a grammar, Leftmost derivation, rightmost derivation, Parse Trees; Applications; Ambiguity in grammars and Languages.

Text Book: 5.1, 5.2, 5.3, 5.4 **(10 hours)**

Module – 4

Properties of Context-Free Languages: Normal forms for CFGs. **Pushdown Automata:** Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

Text Book: 7.1, 6.1, 6.2, 6.3, 6.4 **(10 hours)**

Module – 5

Introduction to Turing Machine: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.
Recap: Summary of the Course

Text Book: 8.1, 8.2, 8.3, 8.4, 8.6 **(10 hours)**

Course Outcomes:

The students will be able to:

CO1: Make use of the concept of abstract machines and their power to recognize the languages.

CO2: Apply the finite state machines for modeling and solving computing problems

CO3: Design grammars, PDA, Turing machine for formal languages.

CO4: Analyze the relationship of language classes, grammar and automata.

Textbooks:

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

References:

1. Peter Linz, An Introduction to Formal Languages and Automata, 3rd Edition, Narosa Publishers, 1998.
2. K.L.P. Mishra, Theory of Computer Science, Automata, Languages, and Computation, PHI Learning, 3rd Edition, 2009.
3. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education, 2012/2013.
4. John C Martin, Introduction to Languages and Automata Theory, Tata McGraw-Hill, 3rd Edition, 2007.

Alternate Assessment Tools (AATs) suggested:

- Application of JFLAP Tool to solve sample problems.
- Assignment questions on decidability and undecidability.

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B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

DATA ANALYTICS AND DESIGN PATTERN (0:0:2:0) 1

(Effective from the academic year 2025-26)

Course Code	BCBL504	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Number of Contact Hours	15 hrs.	Exam Hours	01

Course Objectives:

This course will enable students to:

1. Learn to manage and organize data effectively in Excel.
2. Practice cleaning, validating, and visualizing data for better insights.
3. Understand the concepts and uses of common software design patterns.
4. Develop software solutions using appropriate design patterns and coding practices.
5. Improve existing software by applying suitable design pattern refactoring.

PART A

1a) Working with Data: Importing data, Data Entry & Manipulation, Sorting & Filtering.
1b) Working with Data: Data Validation, Pivot Tables & Pivot Charts.

2a) Data Analysis Process: Conditional Formatting, What-If Analysis, Data Tables, Charts & Graphs.
2b) Cleaning Data with Text Functions: use of UPPER and LOWER, TRIM function, Concatenate.

3a) Conditional Formatting: formatting, parsing, and highlighting data in spreadsheets during data analysis.
3b) 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.

4a) 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.
4b) Create worksheet on Sales analysis of Merchandise Store: data consisting of Order ID, Customer ID, Gender, age, date of order, month, online platform, Category of product, size, quantity, amount, shipping city and other details. Use of formula to segregate different categories and perform a comparative study using pivot tables and different sort of charts

PART-B

1. Singleton Pattern

Problem Statement: Design a centralized *logging system* for an automotive embedded application that ensures only one instance of the logger exists throughout the system. The logger should be thread-safe and accessible from different modules such as engine control, infotainment, and navigation.

2. Factory Method Pattern

Problem Statement: Implement a *report generator* for a banking application that can produce reports in multiple formats (PDF, Excel, HTML) based on user selection. The exact report type should be created at runtime without exposing the creation logic to the client.

3. Observer Pattern

Problem Statement: Develop a *stock price alert system* where multiple clients (mobile app, web dashboard, email notification service) receive updates whenever a stock price changes in the backend system.

4. Decorator Pattern

Problem Statement: Create a *coffee ordering system* for a café that allows adding extra ingredients (milk, cream, syrup, chocolate) dynamically to a basic coffee object without modifying its core structure.

5. Strategy Pattern

Problem Statement: Design a *payment processing system* for an e-commerce platform that supports multiple payment methods (Credit Card, UPI, PayPal, Net Banking). The payment method can be chosen at runtime without altering the payment processing logic.

6. State Pattern

Problem Statement: Implement a *traffic signal control system* where the signal changes states (Red, Yellow, Green) in a predefined sequence. Each state should define its own behavior and transition rules.

Course Outcomes:

The students will be able to:

CO1: Apply Excel's data import, cleaning (UPPER/LOWER/TRIM/CONCAT), validation, conditional formatting, What-If analysis, and PivotTables/Charts to analyze and summarize real-world datasets.

CO2: Create multi-sheet analytical workbooks (e.g., inventory and sales) using formulas (discounts), sorting/filtering, and comparative charts to produce decision-ready reports.

CO3: Analyze problem contexts and select suitable creational/structural/behavioral patterns (Singleton, Factory Method, Decorator, Strategy, State, Observer) to address recurring design issues.

CO4: Implement pattern-conformant solutions that enable thread-safe singletons, runtime object creation, dynamic feature composition, event notifications, interchangeable strategies, and state-driven behavior.

CO5: Evaluate and refactor existing code to incorporate appropriate patterns, comparing alternatives on flexibility, performance, and complexity, and validating improvements through tests.

Textbooks:

1. Design Patterns – Erich Gamma et al., Design Patterns: Elements of Reusable Object-Oriented Software (DP).

Conduction of Practical Examination:

1. All laboratory experiments from part A are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script
4. Mini project Report should be prepared in a standard format prescribed for project work.

Practical Examination Marks distribution:

a) **Part A:** Procedure + Conduction + Viva:10 + 35 +5 =50 Marks

b) **Part B:** Demonstration + Report + Viva voce = 25+15+10 = 50 Marks.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

SOFTWARE PROJECT MANAGEMENT AND DESIGN PATTERN (3:0:0:0) 3

(Effective from the academic year 2025-26)

Course Code	BCB505A	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Outline software engineering principles in building a software.
2. Describe the process of requirement gathering, classification, specification and validation.
3. Understand various software system models and architecture.
4. Discuss various types of software testing practices.
5. Recognize the importance of Project Management and Planning.

Module – 1

Foundations of Software Engineering & Project Management: Introduction to Software Engineering, Software Process Models – Waterfall, Incremental, Agile, Spiral, Project Management Overview, Project Initiation, Business Case & Stakeholder Management, Software Requirements Engineering, Requirements Analysis & Specification, Case Study Discussion on SDLC and Project Initiation

Module – 2

Project Planning & Estimation Techniques Project Planning – Objectives, Work Breakdown Structure (WBS), Effort Estimation, COCOMO Model & Variants, Risk Management – Identification & Analysis, Risk Mitigation & Contingency Planning, Resource Allocation & Scheduling, PERT, CPM, Cost Estimation & Budgeting, Quality Planning – Standards (ISO, CMMI)

Module – 3

Project Monitoring, Control & Team Management: Project Monitoring – Metrics & KPIs, Earned Value Management (EVM), Change Control Process, Configuration Management – Tools & Processes, Software Testing Overview – Unit, Integration, System, Acceptance, Team Formation, Motivation & Leadership, Conflict Management & Communication, Project Closure & Post-Implementation Review

Module – 4

Computational photography: Object-Oriented Design Principles – Introduction, SOLID Principles – SRP, OCP, LSP, ISP, DIP, Design Pattern Introduction – Purpose, Classification Creational Pattern: Singleton, Creational Pattern: Factory Method, Structural Pattern: Adapter, Behavioral Pattern: Observer.

Module – 5

Major Design Patterns & Application: Creational Pattern: Abstract Factory, Creational Pattern: Builder, Structural Pattern: Decorator, Structural Pattern: Composite, Structural Pattern: Proxy, Behavioral Pattern: Strategy, Behavioral Pattern: State, Behavioral Pattern: Chain of Responsibility.

Course Outcomes:

The students will be able to:

CO1: Explain the fundamental concepts of software engineering, software project management, and design patterns.

CO2: Select and apply suitable software development life cycle models, project planning techniques, and estimation methods for real-world projects.

CO3: Develop project schedules, risk management plans, and quality assurance strategies using industry standards and best practices.

CO4: Implement configuration management, project monitoring, and control mechanisms to ensure timely and cost-effective project delivery.

CO5: Apply object-oriented design principles (including SOLID) and implement suitable design patterns to create scalable and maintainable software systems.

CO6: Integrate multiple design patterns and project management practices into a unified software solution and evaluate its effectiveness in meeting project requirements.

Text book:

1. Software Engineering – Roger S. Pressman, Software Engineering: A Practitioner's Approach
2. Software Project Management – Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management
3. Design Patterns – Erich Gamma et al., Design Patterns: Elements of Reusable Object-Oriented Software

References:

1. Ian Sommerville: Software Engineering, 10th Edition, Pearson Education, 2016.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publications, 2005.
3. Stephen R. Schacht, Object Oriented & Classical Software Engineering, Tata McGraw-Hill, 6th Edition, 2005

Alternate Assessment Tools (AATs) suggested:

- Software Requirements Specifications Report on any project.
- MOOC Course of duration minimum 4-8 weeks/25 hours.

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B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

REAL TIME OPERATING SYSTEM - QNX (3:0:0:0) 3

(Effective from the academic year 2025-26)

Course Code	BCB505B	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course Learning Objectives:

This course will enable students to

- Understand the Architecture of QNX Neutrino RTOS and Develop Real-Time Applications
- Understand the working of QNX Development Tools (Momentics IDE)
- Able to Implement Process and Thread Management
- Understand the Master Inter-Process Communication (IPC)
- Debug and Optimize Embedded Systems

Preamble: Operating Systems basics and C programming and Linux commands.

QNX Momentics Development Basics: Eclipse Basics, Targets, Projects and Source, Compiling, Exercise, Running and Debugging, Exercise and Versions.

QNX Neutrino RTOS Environment Setup

Objective: Install and configure QNX SDP, Momentics IDE, and target system (real or virtual).

Outcome: Understand development workflow in QNX.

Module – I

Introduction to QNX Real Time Operating System: Architecture , overview – Executive, Microkernel, Scheduling ,Process manager, Resource manager, System Library , Shared Objects ,OS services , Boot sequence ,Security Inter process Communication, Processes and Threads model, Timing, Interrupt Handling. **(8 hours)**

Module – II

Introduction to Momentics, Eclips basics, Targets, Project and Source, Compiling, Running and Debugging, Versions, Security Policies: Introduction to the use of security policies in securing a QNX system

Processes, Threads & Synchronization: Introduction, Processes: Creation and Detecting termination, Threads, thread creation, operation, Process Termination and Cleanup, Synchronization, Mutexes, Conditional variables, Atomic operations **(8 hours)**

Module – III

Introduction to QNX Inter-Process Communication: Message Passing, Designing a Message Passing System (1): Pulses, Client Information Structure, How a Client Finds a Server, Multi-Part Messages. Designing a Message Passing System (2),Issues Related to Priorities, Designing a Message Passing System (3) - Server Designs ,Designing a Message Passing System (3) - Deadlock Avoidance, Event Delivery, Shared Memory

Comparing QNX IPC Methods: The Methods, How to Choose **(8 hours)**

Module – IV

QNX Inter-Process Communication: Issues Related to Priorities, Designing a Message Passing System (2): Event Delivery Shared Memory

Introduction to Hardware Programming: Hardware I/O, Programming PCI bus devices, Handling Interrupts. **(8 hours)**

Module – V

Timers, Clocks and Timeouts: Introduction, Timing Architecture, Getting and Setting the System Clock, Introduction to Timers, High-Resolution Timers, Design Considerations, Kernel Timeouts.

Build a QNX Neutrino Boot/OS Image: Introduction, Images & Buildfiles, Images & Buildfiles: Exercise option

Resource Managers: Introduction, A Simple Resource Manager: Initialization and Handling read() and write(). **(8 hours)**

Course outcomes:

The students will be able to

CO1: Understand the Architecture of QNX Neutrino RTOS and implement Real-Time Applications

CO2: Apply the working of QNX Development Tools (Momentics IDE) on Processes, Threads & Synchronization and Inter-Process Communication.

CO3: Apply the QNX Inter-Process Communication with Hardware Programming and Interrupt handling

CO4: Implement the timing architecture, High-Resolution Timers, Images & Buildfiles and Resource Manager

Text books:

1. Operating Systems: Design and Implementation - Andreq S Tanenbaum
2. The Linux Programming Interface- Michael Kerrisk

Reference Books

1. Operating Systems:A Concept-Based Approach -Dhamdhere

Alternate Assessment Tools (AATs) suggested:

- Students have to take certification program on advanced concepts of AI from MOOCS and Demonstrate with a Case Study.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

FUNDAMENTALS OF MARKETING AND RESEARCH (3:0:0:0) 3

(Effective from the academic year 2025-26)

Course Code	BCB505C	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to: (List as per the requirement of your course)

1. To understand the meaning, scope, objectives, and methods of marketing research.
2. To learn how to use statistical tools to study and interpret marketing data.
3. To analyze consumer behavior, market segmentation, targeting, and positioning strategies.
4. To learn how to plan pricing, promotion, and product strategies for different markets.
5. To understand the basics and applications of digital marketing in business.

Module – 1

MARKETING RESEARCH: Introduction to marketing research, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research **(8 hours)**

Module – 2

MARKETING RESEARCH & DATA ANALYSIS: Marketing Research & Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis. **(8 hours)**

Module – 3

MARKETING MANAGEMENT CONCEPTS:

Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector. Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social Understanding the consumer: Determinants of consumer behavior, Factors influencing consumer behavior.Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning **(8 hours)**

Module – 4

PRICING, PROMOTION AND PRODUCT DECISIONS: Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging, Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising **(8 hours)**

Module – 5

DIGITAL MARKETING: Concept and components of digital marketing. Digital marketing communications, digital marketing in India, B2B marketing **(8 hours)**

Course Outcomes:

The students will be able to:

CO1: Explain the concept, objectives, and limitations of marketing research including qualitative and quantitative approaches.

CO2: Apply descriptive and inferential statistical tools and techniques in analyzing marketing data.

CO3: Analyze the marketing environment and segmentation strategies in marketing planning.

CO4: Design strategies for new product development and branding.

CO5: Apply digital marketing communication strategies across various online platforms

Textbooks:

1. Marketing Management (2019), Philip Kotler & Keller Kevin,4th edition, Pearson education
2. Marketing Management (2019), Deepak, R. Kanthiah Alias, and S. Jeyakumar, Educreation Publishing
3. Marketing Management: A relationship approach (2019), Hollensen, S, Pearson Education.
4. Marketing research: An applied approach (2019), Malhotra, N. K., Nunan, D., & Birks, D. F., Pearson Education Limited.

References:

1. Marketing research: Text and cases (2020), Nargundkar, R, McGraw-Hill Education.
2. Marketing management: A cultural perspective (2020), Visconti, L. M., Peñaloza, L., & Toulouse, N. (Eds.) Routledge.

Alternate Assessment Tools (AATs) suggested:

- MOOCS (details)
- Program Based Assignment of higher cognitive levels.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

BANKING AND FINANCIAL SERVICES (3:0:0:0) 3

(Effective from the academic year 2025-26)

Course Code	BCB505D	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. To understand the Indian Financial Management.
2. To learn the functions of various Financial Services in India.
3. To understand role of Banking and Financial Services in Business organizations
4. To know the functioning of NBFC 's in India

Module – 1

Financial System: Functions of a financial system. Financial System and Economic Development. Indian financial system, Markets and Regulators. Banks and technology- Various IT products and services-International banking services.

SEBI: Role and functions of SEBI.

Reserve Bank of India: Functions of RBI. Recent Policy Developments in the Indian Financial system

Money Market in India: Organized and Unorganized Market, Money market structure Functions and Instruments. (Theory) **(8 hours)**

Module – 2

Merchant Banking: SEBI guidelines for merchant bankers – Issue Management: Project appraisal, designing capital structure and instruments, Issue pricing, preparation of prospectus, Underwriting, Mergers & Amalgamations, Corporate Advisory Services, Bought out deals, Equity issues – Rights issues– Debenture issues – Book building – Private Placements – Pre & Post issues activities – Raising capital from International markets: ADRs, GDRs , ECB etc Debt Syndication. (Theory) **(8 hours)**

Module – 3

NBFCs; Leasing & Hire Purchase Banking:

NBFCs: An Overview -Types of NBFCs in India- Growth, Functions and Regulatory framework. (Theory)

Leasing & Hire Purchase: Nature and scope of leasing, Types of leasing, Problems in Evaluation of Leasing. Nature and forms of Hire purchase agreements, Problems in Evaluation of Hire Purchase. (Theory and Problems) **(8 hours)**

Module – 4

Credit Rating: Meaning, Process, Methodology, Agencies And Symbol

Factoring & Forfeiting – Definition, Functions, Types and Services offered.

Venture Capital: Concept, features, Process, Stages. Private equity- Investment banking perspectives in private equity. Performance of Venture Capital Funded Companies In India. (Theory) **(8 hours)**

Module – 5

Depository System: Objectives of Depository System, Activities, NSDL& CDSL. Process of Clearing and Settlement.

Securitization of Debt: Meaning, process, Types, Benefits. (Theory)

Mutual Funds -Meaning, Structure, Functions, Participants, Types of Funds, Types of Schemes, Performance of Mutual Funds, Factors contributing for the growth of mutual funds in India, Marketing of mutual funds. (Theory) **(8 hours)**

Course Outcomes:

The students will be able to:

CO1: To understand basics of financial system, RBI, SEBI and Indian money market.
CO2: Understand & appreciate activities of merchant banking towards raising of long-term funds.
CO3: Analysing Institutional financing such as micro finance, leasing & hire purchase banking.
CO4: Assess the procedure involved in credit rating, factoring forfeiting & venture capital.
CO5: Understanding of procedures involved in depository system, debt securitization & mutual funds in India

Textbooks:

1. Financial services by Khan M.Y, McGraw Hill Education, 6th Edition,2011.
2. Management of Banking and Financial services by Padmalatha Suresh & Justin Paul, Pearson. 3rd Edition.
3. Merchant Banking and Financial Services by Madhu Vij, SwatiDhawan, McGraw Hill Education, 2nd Edition

References:

1. Financial Markets and Services by K. Natarajan, E. Gordan, Himalaya Publishing House, 2009.
2. Banking and Financial Services by Mukund Sharma, Himalaya Publishing House, 2015.

Alternate Assessment Tools (AATs) suggested:

Introduction to banking and financial markets
https://www.edx.org/course/introduction-bankingfinancial-markets-i-iimbx-fc201-1x-0

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

RESEARCH METHODOLOGY AND IPR (2:0:0:0)2

Common to all Branches

(Effective from the academic year 2025-26)

Course Code	BRMK507	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:0:0:0	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Explain the research process and the research problem.
2. Gain knowledge on research design, sampling survey, and data collection.
3. Familiar with Interpretation and report writing.
4. Understand the concept of IP, patent, and copyright.
5. Enhance knowledge on trademarks, industrial, and IC layout design.

Preamble:

In the evolving landscape of academia, industry, and innovation, the importance of structured research methodology and awareness of intellectual property rights has become indispensable. This course aims to provide a comprehensive foundation in the principles, processes, and practices of scientific research while emphasizing the legal and ethical dimensions of knowledge protection.

Module – 1

Research Methodology: Meaning of Research, Objectives of research, types of research, research approaches, Significance of research, Research Process: Formulating research problem, Research methods versus methodology, Research and scientific method. Criteria of good research.

Defining the Research Problem: What is a Research Problem? Selecting the Research Problem, Necessity of Defining the Problem, and Techniques Involved in Defining a Problem.

Textbook1: Chapters 1 &2 (06 Hours)

Module – 2

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design. Research Design in the case of exploratory research studies, descriptive and diagnostic research studies. Basic Principles of Experimental Designs.

Design of Sample Survey: Sample Design: Objective, size of sample, parameter of interest, selection of a proper sample design. Sampling errors, non-sampling errors.

Data Collection: Experiments and Surveys, collection of primary data: observation method. Collection of secondary data. Selection of an appropriate method for data collection.

Textbook1: Chapters 3: 3.1-3.3,3.5.1-3.5.2, 3.6, Chapter 4: 4.1-4.3,& Chapter 6: 6.1-6.5 (05 Hours)

Module – 3

Interpretation and Report writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in interpretation, Significance of report writing, Different steps in report writing, layout of the research report, Types of reports, Oral presentation, Mechanics of writing research report, Precautions for writing a research report.

Textbook 1: Chapters 19 (05 Hours)

Module – 4

Introduction to IP: Various forms of IP, Importance of intellectual property, Trade policy Reviews, Agreement on trips.

Patent: What is a patent, conditions for the grant of a patent, Temporal and spatial aspects of patent. right of the patentee, Patent Office, and the register of patents.

Copyright: What is Copyright ? , meaning of publication, ownership of copyright,

license of copyright, term of copyright, Internet, and copyright issues.

Textbook 2: Chapters 1 : 1.1,1.2, 2 : 2.1, 2.3, 2.9, 2.11,2.12 & 4: 4.1,4.2,4.5,4.7,4.16 (05 Hours)

Module – 5

Trademarks: Introduction to trademark, term of trademark, collective marks, certification trademarks.

Industrial Design: Registration of Design: Non-registrable designs under The Design Act 2000, Conditions for registration of Industrial Designs. Term of Industrial Designs.

IC Layout Design: Integrated Circuits Layout Design, Grant of registration of IC Layout Design.

Textbook 2: Chapters 5 : 5.1,5.2,5.7 ,5.10,5.11 & 6 : 6.1-6.4,6.6 ,6.12 (05 Hours)

Course Outcomes:

The students will be able to:

CO1: Illustrate research process and research problem.
CO2: Describe research design, sampling survey, and data collection.
CO3: Explain the techniques of Interpretation and report writing.
CO4: Summarize the concept of IP, patent, and copyright.
CO5: Discuss trademarks, industrial, and IC layout design.

TEXTBOOKS:

1. CR Kothari and Gaurav Garg, Research Methodology, New Age International Publishers, Fifth Edition, 2024.
2. Neeraj Pandey, Khushdeep Dharni, "Intellectual Property Rights", PHI Learning, 2014.

REFERENCES:

1. Dinakar Deb, Rajdeep Dey, Valentina, Engineering Research Methodology, Springer, 2019.
2. David V. Thiel, Research method for engineers, Cambridge University Press, 2014.
3. Prabhuddha Ganguli, "Intellectual Property Rights", Tata McGraw–Hill, 2017.

Alternate Assessment Tools (AATs) suggested:

1. A literature survey paper on any contemporary topic/problem can be carried out.
2. Survey data analysis: The systematic examination of responses collected through surveys, using statistical or computational techniques, to identify trends and patterns, summarize responses, Test hypotheses, and draw meaningful conclusions.
3. Case study analysis: Case Study Analysis (Group or Individual) choosing the Topic: Famous Patent or Copyright Dispute.

B.E. COMPUTER SCIENCE AND BUSINESS SYSTEMS

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER -V

Environmental Studies (1:0:0:0)1

Common to all Branches

(Effective from the academic year 2025-26)

Course Code	BESK508	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	1:0:0:0	SEE Marks	50
Total Number of Lecture Hours	15	Exam Hours	01

CREDITS: 01

Course objectives:

This course will enable students to

1. Recognize the ecological basis for regional and global Environmental issues, and lead by example as an environmental steward.
2. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
3. Analyze the trans-national character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as environmentalists.

Module – 1

Biodiversity: Types, Value, Hot spots and Threats. **(3 Hours)**

***Field work:** Visit to a local area to document environmental assets: River / Forest / Grassland / Hill

Module – 2

Environmental Pollution & Abatement & Relevant Acts: Water, Soil and Air Pollution. **(3 Hours)**

***Field work:** Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, followed by observation and documentation of environmental pollution and recommendation of remedial measures.

Module – 3

Waste Management & Public Health Aspects & Relevant Acts: E-waste, Bio-medical & Hazardous wastes. **(3 Hours)**

***Field work:** Visit to a Resource Management Facility or Waste Treatment Facility, followed by understanding of process and its brief documentation.

Module – 4

Global Environmental Concerns: Ground water depletion, Climate Change and Carbon Trading. **(3 Hours)**

*Field work: Visit to a Green Building, followed by understanding of process and its brief documentation.

Module – 5

Latest Developments in Environmental Pollution Mitigation: E.I.A., E.M.S., SDG. **(3 Hours)**

*Field work: Visit to Environmental NGOs, followed by brief documentation.

Self-Study/Discussion on Case Studies**:** Environmental Stewardship

*** Any one Field Work is to be successfully accomplished. The same will be assessed for AAT.**

Course outcomes:
The students will be able to:

CO1: Appraise the significance of ecological systems under the ambit of environment.
CO2: Analyze for the consequences owing from anthropogenic interactions on the environmental processes.
CO3: Recommend solutions in the Anthropocene Epoch, with an in-depth understanding of the interdisciplinary facets of environmental issues.
CO4: Elucidate the trans-national character of environmental problems and ways of addressing them.
CO5: Appraise latest developments, concerns and ethical challenges associated with Environmental Protection.

Text Book:

1. Rajesh Gopinath and N. Balasubramanya, "Environmental science and Engineering", 1st Edition, Cengage Learning India Private Limited, 2018.
2. J. S. Singh, S. P. Singh and S. R. Gupta, "Ecology, Environmental Science and Conservation", India, S. Chand Publishing, 2017.

References:

1. M. Gadgil and R. Guha, "This Fissured Land: An Ecological History of India", Univ. of California Press, 1993.
2. E. P. Odum and H. T. Odum, "Fundamentals of Ecology", Philadelphia: Saunders Publisher, 1971.
3. M. L. Mckinney, "Environmental Science systems & Solutions", Web enhanced Edition, City of Publisher, R. M. Publisher, 1996.

ASSESSMENT METHODS:

CIE Components (50 Marks)
The pattern of the CIE question paper is MCQ.
Two Unit Tests each of 40 Marks, MCQ type (duration 01 hour). Average of the two Internal Assessments Tests Marks will be out of 40 Marks, which is further scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Two Assignment / AATs : 25 Marks [each]
Sum of the Assignment and AATs will be out of 50 Marks and scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Internal Assessments Tests : 25 Marks
Assignment and AAT : 25 Marks
Total CIE Marks : 50 Marks (Student should score a minimum of 20 marks to be eligible.)

SEE Components (50 Marks)

- The pattern of the SEE question paper is MCQ.
- SEE question paper will be set for 50 questions of each of 01 marks. (Student should score a minimum of 20 marks to be eligible.)

Assessment Details (both CIE and SEE):

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 100%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each 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.