SEMESTER IV

Course Code	Course name	L	T	P	C
CSEG2065	Data communication and Networks	3	0	0	3
Total Units to be Covered: 5	Total Contact Hours: 45				
Prerequisite(s):	Digital Electronics	Syllabus version: 1.0			

Course Objectives

The objectives of this course are as follows:

1) Understand the basic components and functions of computer networks, including network topologies, protocols, and networking devices.
2) Understand need of layered architecture and differentiate OSI and TCP/IP
3) Gain an understanding of error and flow control techniques on communication channels.
4) Explore routing algorithms and its application.
5) Get a brief idea about network analysis tools (Wireshark, NMAP).

Course Outcomes

The outcomes of this course are as follows:

CO1: Evaluate network devices functionality and network command significance.

CO2: Evaluate and address problems of error control, flow control, and channel access.

CO3: Analyze and adopt fundamental workings of routing algorithms.

CO4: Create solutions for recent challenges in large-scale networks.

CO5: Apply knowledge of network traffic analysis tool to investigate network activities.

CO-PO Mapping

Program Outcomes / Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	3	-	-	-	-	2	-	-	3	-	-	-
CO 2	-	2	3	2	-	-	-	-	-	-	-	3	2	-	-
CO 3	2	3	3	3	2	2	-	-	2	-	-	3	3	2	-
CO4	3	3	3	3	2	-	-	2	2	-	2	3	2	3	-

CO5	2	3	3	3	3	3	**-**	2	2	2	3	3	3	3	**-**
Average	1.8	2.6	2.8	2.8	1.4	1	**-**	0.8	1.6	0.4	1	3	2	1.6	**-**

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **"_" means there is no correlation**

Syllabus

Unit I: Basic of Computer Networking and Technologies 9 Lecture Hours

Introduction to Computer Networking Concepts: Layered Network Protocol Architectures (OSI, TCP/IP); LAN, WAN, MAN, PAN, LAN Topologies; Connectivity Devices and Cable Types; Ethernet, Gigabit Ethernet (GbE); Circuit Switching, Message Switching, and Packet Switching; WiMAX, 5G and beyond, Cellular Technology, Communication Channels and performance metrics.

Unit II: Data Link Layer - Part 1 9 Lecture Hours

Logical Link Control (LLC) sub-layer: Framing, Data Communication Character Codes, Error Control: Error Detection (Redundancy Checking: VRC, Checksum, LRC, CRC); Retransmission, Error Correction: Forward Error Correction (Hamming Code), Character Synchronization, Reliable transmission and Automatic Repeat Request (ARQ) protocols including Stop-and-Wait, Go-back-N, Selective Repeat; Performance analysis of ARQ protocols; Example protocols such as HDLC and PPP.

Unit III: Data Link Layer - Part 2 8 Lecture Hours

Medium Access Control (MAC) sub-layer: Channel Allocation Problems, Multiple Access Protocols and Types: TDMA, FDMA, CSMA, CSMA/CD, CSMA/CA protocols; Hidden Node and Exposed Node Problems, Performance analysis; Shared and Switched Ethernet; IEEE Standards 802.3 & 802.11, 10-Gigabit Ethernet.

Unit IV: Network Layer 10 Lecture Hours

Network Layer Design Issues, Network Address Translation, Internet Protocol (IP): IPv4 and IPv6 addressing; IP Addressing Techniques: Classful Addressing, Classless Addressing, Network and Host Identification, Loopback Address, Broadcast Address, Address Masking; Networks and Subnetworks: Subnetting, Subnet Mask, Supernetting; Network-Layer Protocols: ARP, RARP, IP datagram; Internetworking: Routing and Routing protocols (distance-vector and link-state); Interior and Exterior Gateway Protocol concepts; Routing Algorithms including Dijkstra's algorithm and distributed Bellman-Ford algorithm; Example protocols: OSPF, RIP, BGP, Encapsulation and Tunneling, Congestion Control, Quality of Service, Introduction of Wireshark Tool.

Unit V: Transport Layer **9 Lecture Hours**

Introduction and Transport-Layer Services, Port Address, Socket Address; Internet Transport Protocols: UDP, Introduction to UDP, Remote Procedure call, Real-time Transport Protocols; Internet Transport Protocols: TCP, service model, TCP protocol, TCP segment header, TCP Connection establishment, TCP Connection Release, TCP Connection management modeling, TCP sliding window, TCP Timer management, TCP Congestion control; Performance Issues: Performance problems in computer networks, Network Performance Management, Host Design for fast networks; Fast segment processing, Header compression, protocols for long Fat networks; Virtual Private Network (VPN); Introduction of Nmap Tool.

Total lecture Hours 45

Textbooks

1. James F. Kurose, and Keith W.Ross, "Computer Networking : A Top-Down Approach", 8th Edition, Pearson, 2022.

2. W. Tomasi, "Introduction to data communications and networking", 5th edition, Prentice-Hall, Inc., 2008.

Reference Books

1. Walter Goralski, "The illustrated network: how TCP/IP works in a modern network", 2nd Edition, Morgan Kaufmann, 2017.

2. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2023.

3. L. L. Peterson, and B. S. Davie, "Computer networks: a systems approach", 6th Edition, Elsevier, 2020.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme

Components	**IA**	**MID SEM**	**End Sem**	**Total**
Weightage (%)	50	20	30	100

Detailed breakup of Internal Assessment

Internal Assessment Component	**Weightage in calculation of Internal Assessment (100 marks)**
Quiz 1	15%
Quiz 2	15%
Class Test 1	15%
Class Test 2	15%
Assignment 1/Project	20%
Assignment 2/Project	20%

Course Code	Course name		L	T	P	C
CSEG2165	Data communication and Networks Lab		0	0	2	1
Total Units to be Covered: 12		Total Contact Hours: 30				
Prerequisite(s):			Syllabus version: 1.0			

Course Objectives

The objectives of this course are as follows:

1. Understand the basic components and functions of computer networks, including network topologies, protocols, and networking devices.
2. Gain an understanding of error and flow control techniques on communication channels.
3. Explore IP addressing, subnetting, routing algorithms and their application.
4. Get a brief idea about network analysis tools (Wireshark, NMAP).

Course Outcomes

The outcomes of this course are as follows:

CO1: Evaluate network devices functionality and network command significance.

CO2: Implement error control algorithm.

CO3: Analyze and implement routing algorithms.

CO4: Implement and evaluate various network topologies.

CO5: Familiarize with network simulator and network traffic analysis tools.

CO-PO Mapping

Program Outcomes / Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO 2	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO 3	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO 4	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO 5	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
Average	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **“_” means there is no correlation**

List of Experiments

Experiment 1: Familiarization with networking devices. **(CO1)**

Experiment 2: Write a program for bit stuffing and de-stuffing in a bit stream. **(CO2)**

Experiment 3: Write a program for CRC and Hamming Code. **(CO2)**

Experiment 4: Familiarization with Network IP, subnetting and supernetting. **(CO3)**

Experiment 5: Familiarization of basic network command and network configuration commands. **(CO1, CO5)**

Experiment 6: Set up a network topology in Cisco Packet Tracer (Ring, Bus, Star, Mesh etc.) **(CO4, CO5)**

Experiment 7: Set up network topology in two and more than two routers. **(CO4, CO5)**

Experiment 8: Distance vector routing protocol **(CO3)**

Experiment 9: Link-state vector routing protocol **(CO3)**

Experiment 10: Familiarization with network monitoring tools (NMAP and Wireshark) **(CO5)**

Experiment 11: Capture network traffic using Wireshark. **(CO5)**

Experiment 12: Analyzing network traffic using Wireshark. **(CO5)**

Total Lab hours 30

Textbooks

1. James F. Kurose, and Keith W.Ross, "Computer Networking : A Top-Down Approach", 8th Edition, Pearson, 2022.

2. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2023.

Reference Books

1. W. Tomasi, "Introduction to data communications and networking", 5th edition, Prentice-Hall, Inc., 2008.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme: Continuous Assessment

Components	Quiz & Viva	Performance & Lab Report
Weightage (%)	50	50

Course Code	Course name		L	T	P	C
CSEG2064	Software Engineering		3	0	0	3
Total Units to be Covered: 5		Total Contact Hours: 45				
Prerequisite(s):	Basic Knowledge of Programming		Syllabus version: 1.0			

Course Objectives

1. To explore software development methodologies (waterfall, agile, DevOps) and their integration of testing, quality assurance, reliability, and risk management.
2. To comprehend software requirements engineering and develop skills in creating well-structured Software Requirements Specifications (SRS).
3. To acquire understanding of planning a software project, its cost estimation models and to understand the software quality models.

Course Outcomes

CO 1. Understand the fundamental concepts and importance of Software Engineering in modern software development.

CO 2. Learn various software development methodologies, including Agile, Waterfall, and iterative approaches.

CO 3. Explore software design principles and architectural patterns for creating robust and maintainable software systems.

CO 4. Apply project management principles to effectively plan, monitor, and control software projects.

CO-PO Mapping

Program Outcomes / Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	2	2	1	-	-	-	2	-	3	-	1	2	-
CO 2	2	3	2	2	1	-	-	-	2	-	3	-	1	2	-
CO 3	2	3	2	3	1	-	-	-	2	-	3	-	1	2	-
CO 4	2	3	2	3	1	-	-	-	2	-	3	-	1	2	-
Average	2	3	2	2.5	1	-	-	-	2	-	3	-	1	2	-

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **“_” means there is no correlation**

Syllabus

Unit I: Introduction to Software Engineering 7 Lecture Hours

Definition of Software Engineering, S/W characteristics, applications, Software development life cycle ; Life Cycle Models – Waterfall (classical and iterative), Spiral, Prototyping & RAD Models, Software processes, Process Models – overview Agile Model and Various Agile methodologies - Scrum, XP, Lean, and Kanban. Scope of each model and their comparison in real-world case studies.

Unit II: Requirements Modelling and Design 9 Lecture Hours

System and software requirements; Requirements Engineering-Crucial steps; types of requirements, Functional and non-functional requirements; Domain requirements; User requirements; Elicitation and analysis of requirements; Requirements documentation – Nature of Software, Software requirements specification, Use case diagrams with guidelines, DFD, SRS Structure, SRS Case study, Design concepts and principles - Abstraction - Refinement - Modularity Cohesion coupling, Architectural design, Detailed Design Transaction Transformation, Refactoring of designs, Object-oriented Design User-Interface Design.

Unit III: Software Reliability 9 Lecture Hours

Introduction to Software Reliability; Hardware reliability vs. Software reliability; Reliability metrics; Failure and Faults – Prevention, Removal, Tolerance, Forecast; Dependability Concept – Failure Behavior, Characteristics, Maintenance Policy; Reliability and Availability Modeling; Reliability Evaluation Testing methods, Limits, Starvation, Coverage, Filtering; Microscopic Model of Software Risk; Classes of software reliability Models; Statistical reliability models; Reliability growth models; Defining and interpreting reliability metrics; Fault Detection and Prevention; Techniques for detecting and mitigating software faults; Static analysis tools and techniques; Dynamic analysis methods; Software Fault Tolerance; Software Maintenance and Reliability; Reliability Assessment and Evaluation; Methods for assessing and quantifying software reliability; Case Studies and Real-world Applications.

Unit IV: Software Testing, metrics and Quality Assurance 10 Lecture Hours

Testing types and techniques such as black box, white box, and gray box testing, functional and structural testing; Test-driven development, code coverage, and quality metrics; Testing process, design of Test cases, testing techniques - boundary value analysis - equivalence class testing - decision table testing, cause-effect graphing, path testing, data flow testing, and mutation testing. Unit, integration, system, alpha, and beta testing, debugging techniques; verification and validation techniques, levels of testing, regression testing, quality management activities, product and process quality standards (ISO9000, CMM), metrics understanding (process, product, project metrics), size metrics (LOC, Function Count, Albrecht FPA), product metrics, metrics for software maintenance, cost estimation techniques (static, single variable, multivariable models), cost-benefit evaluation techniques, Testing tools and standards such as Jira and Selenium, test automation frameworks and tools (Selenium, Appium, JUnit), performance testing and load testing, and defect management and root cause analysis.

Unit V: Software Quality and Risk Management 10 Lecture Hours

McCall quality factors, ISO and CMM Model, Tools and Techniques for Quality Control, Pareto Analysis, Statistical Sampling, Quality Control Charts and the seven Run Rule. Modern Quality Management, Risk Management – importance, types, process and phases, qualitative and quantitative risk analysis, Risk Analysis and Assessment, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation. Software Reliability: Reliability Metrics, Reliability Growth Modeling. Use Case: Defect Tracking and Management. Test Automation Tools: Jira, Selenium:, Appium; JUnit.

Total lecture Hours 45

Textbooks

1. Roger S. Pressman, "Software Engineering: A practitioner's approach", 7th Edition, McGraw Hill, 2009.

2. Pankaj Jalote, "An integrated approach to Software Engineering", 3rd Edition, Springer/Narosa, 2005.

Reference Books

1. James F. Peters, and Witold Pedrycz, "Software Engineering: an Engineering approach", John Wiley, 2007.

2. Waman S Jawadekar, "Software Engineering principles and practice", McGraw Hill, 2004.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme

Components	**IA**	**MID SEM**	**End Sem**	**Total**
Weightage (%)	50	20	30	100

Detailed breakup of Internal Assessment

Internal Assessment Component	**Weightage in calculation of Internal Assessment (100 marks)**
Quiz 1	15%
Quiz 2	15%
Class Test 1	15%
Class Test 2	15%
Assignment 1/Project	20%
Assignment 2/Project	20%

Course Code	Course name	L	T	P	C
MATH2059	Linear Algebra	3	0	0	3
Total Units to be Covered: 6	Total Contact Hours: 45				
Prerequisite(s):	Discrete Mathematics, Advanced Engineering Mathematics 1 & 2	Syllabus version: 1.0			

Course Objectives

The course aims to

1. Provide students with understanding of fundamental concepts of linear algebra and their applications.

2. Develop mathematical models employing Linear Algebra framework for problems arising in a variety of disciplines.

3. Empower the students to learn and formulate problems using linear Algebra in science, engineering including emerging areas like data analytics and deep learning.

Course Outcomes

On completion of this course, the students will be able to

CO1. Model situations in diverse contexts involving vectors, matrices, and systems of linear equations.

CO2. Demonstrate an interplay between the core mathematical concepts and applications in computer and allied sciences.

CO3. Comprehend and visualize concepts of eigenvalues and eigenvectors in computer graphics and emerging applications.

CO4. Apply SVD, a powerful technique, which is crucial for various computational tasks, including machine learning, computer graphics, data compression, and image processing.

CO-PO Mapping

Program Outcomes Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO 1	2	2	2	3	-	-	-	-	2	-	-	3	-	-	-
CO 2	1	2	3	2	-	-	-	-		-	-	3	2	-	-
CO 3	2	3	3	3	2	2	-	-	2	-	-	3	3	2	-
CO 4	3	3	3	3	2	-	-	2	2	-	2	3	2	2	-
Average	2	2.5	2.75	2.75	1	.5	-	.5	1.5	-	.5	3	1.75	1	-

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **"_" means there is no correlation**

Syllabus

Unit I: Introduction to Linear Algebra **1 Lecture Hours**

Linearity vs Non-linearity (Real life examples), Panoramic view of linear algebra(Linear + algebra), Mention of emerging Applications of Computer Science: Google PageRank, Google Maps, etc.

Unit II: System of Linear Equations **8 Lecture Hours**

Vectors and linear combination, Visualization of the system of linear equations, Elimination using matrices, Rank of a matrix, Echelon forms, Normal form, Solution of a homogeneous and non-homogeneous system of equations, Applications in emerging areas: Machine learning models, Cryptography and Color models, Recap of Unit-II.

Unit III: Vector Spaces and Linear Transformation **12 Lecture Hours**

Vector spaces and subspaces, Linear span, Linear independence/dependence of vectors, Basis and dimension, Linear mapping, Matrix as a linear mapping, Kernel and image of linear mapping, Null space, Rank nullity theorem, Singular and non-singular mappings, Isomorphisms, Operations with linear mappings, Similarity of matrices, Change of basis, Inner product spaces, Vector and matrix norms, Orthogonality, Orthogonal sets and bases, Projections, Gram-Schmidt orthogonalization process, Applications of linear transformation: Data Smoothing, Image scaling, Recap of Unit III.

Unit IV: Eigenvalues and Eigenvectors **8 Lecture Hours**

Polynomial of matrices, Characteristic polynomial, Cayley-Hamilton theorem, Eigenvalues and eigenvectors, Geometric interpretation of eigenvectors, Diagonalization, Power of a matrix, Function of matrices, Diagonalization of symmetric matrices, Quadratic forms, Methods for computing Eigenvalues, Method of Least squares, Application of Eigensystems: Facial and Ear recognition, Feature extraction, Internet search engines. Recap of Unit IV.

Unit V: Singular value decomposition **8 Lecture Hours**

Spectral decomposition, Singular value decomposition (SVD), Best rank k approximations, Power method for computing the Singular value decomposition, Applications of Singular value decomposition: Principal component analysis, Singular vectors, Centering data, Ranking documents and Web pages, Clustering, Recap of Unit V.

Unit VI: Applications of Linear Algebra: **8 Lecture Hours**

Computational Approach

Applications of linear systems: Design of traffic patterns/Circuit with one closed loop/Balancing chemical equations; Data compression using SVD, Word Embeddings and Exploring Biases in Data, Markov Matrices and Applications to PageRank, Game of strategy, Vector space models for information retrievals, Vector matrix: Moves on a chessboard, Distribution of genotypes in a population.

Total lecture Hours 45

Textbooks

1. G. Strang, "Linear Algebra and its Applications", 4th Edition, Cengage Learning, 2005.

2. G. Williams, "Linear Algebra with Applications", 8th Edition, Jones and Bartlett Learnings, 2012.

3. H. Anton, and C. Rorres, "Elementary linear algebra with supplemental applications", 11th Edition, Wiley, 2016.

Reference Books

1. I. Goodfellow, Y. Bengio, and A. Courville, "Deep Learning", The MIT Press, 2016.

2. K. Singh, "Linear Algebra Step by Step", Oxford University Press, 2013.

3. D. C. Lay, Steven R. Lay, and Judi J. McDonald, "Linear Algebra and its Applications", 5th Edition, Pearson Education India, 2023.

4. H. Wendland, "Numerical Linear Algebra An Introduction", Cambridge University Press, 2018.

5. W. Ford, "Numerical linear algebra with applications using MATLAB", Academic Press, 2014. [Chapter 7, 15, 17]

6. J. MacCormick, "Nine Algorithms that Changed the Future", Princeton University Press, 2021.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme

Components	IA	MID SEM	End Sem	Total
Weightage (%)	50	20	30	100

Detailed breakup of Internal Assessment

Internal Assessment Component	Weightage in calculation of Internal Assessment (100 marks)
Quiz 1	15%
Quiz 2	15%
Class Test 1	15%
Class Test 2	15%
Assignment 1/Project	20%
Assignment 2/Project	20%

Course Code	Course name	L	T	P	C
CSEG2020	Object Oriented Programming	3	0	0	3
Total Units to be Covered: 6	Total Contact Hours: 45				
Prerequisite(s):	Programming in C	Syllabus version: 1.0			

Course Objectives

1. Understand the need for OOPs and develop Java programs with object-oriented features.
2. Learn the concepts of JDBC and develop standalone application with GUI Panel.
3. Design & implement Java applications for real world scenarios.

Course Outcomes

CO1. Understand Object Oriented Programming concepts and architecture of Java.

CO2. Analyze and model the real-world entity using Java programming language.

CO3. Develop packages with Generics and Implement Interfaces with Exception handling.

CO4. Create Stand-alone Java applications using GUI swings and JDBC.

CO-PO Mapping

Program Outcomes Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	2	3	-
CO 2	-	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO 3	-	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO 4	-	-	-	2	-	-	1	-	2	2	-	-	2	3	-
Average	.25	1.5	1.5	.5	-	-	.25	-	.5	1	-	-	2	3	-

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **“_” means there is no correlation**

Syllabus

Unit I: Introduction to OOPs **5 Lecture Hours**

Object Oriented Programming History and Evolution, Object Oriented Programming Principles, Features of Java, Input Output Statements, Comment Line Arguments, Data Types, Variables, Operators, Program Control Statements, Arrays, Type of Arrays, Strings.

Unit II: Classes, Inheritance, Packages and Interfaces **8 Lecture Hours**

Class Fundamentals, Objects, Constructors, Garbage Collection, this Keyword, Java's Access Modifiers, Method Overloading, static Keyword, Inheritance, Types of Inheritance, super to Access Superclass Members, Method Overriding, Abstract Classes, Using final, Packages and Interfaces, Build-in Interface, User defined Interfaces.

Unit III: Nested Classes, Exceptions, Multithreading & IO Streams **8 Lecture Hours**

Nested Classes, Types of Nested Classes, Exception Handling, Exception Handlers, Concurrent Programming, The Thread Class and Runnable Interface, Thread Priorities, Synchronization, Java's I/O Streams, Byte Streams and Character Streams, FileWriter, FileReader.

Unit IV: Generics, Lambdas, GUI Swing & Database Connectivity **8 Lecture Hours**

Generics Fundamentals, Generic Class, Generic Methods, Lambdas, Functional Interfaces, Swing, Components and Containers, Layout Managers, Swing Event Handling, Event Listeners, Event Classes and Listener Interfaces, Swing Controls, Database Connectivity, Statement, Prepared Statement, CallableStatement, Resultset. Persistent Data.

Unit V: Collections and Wrapper Class **6 Lecture Hours**

Collections, Iteration, Collection Interface, Set and SortedSet, List, Map and SortedMap, Wrapped Collections and Collections Class, Wrapper classes and loading classes.

Unit VI: Capstone Project **10 Lecture Hours**

Create Standalone Java Project, Designing of UML and database diagrams, GUI Panel development using swing, Establish connection with Database and Panel. Source Code Management and Collaboration using Git/GitHub. Unit Testing using JUnit, Integration Testing, Build and Artifactory Management.

Total lecture Hours 45

Textbooks

1. Herbert Schildt, "Java: A Beginner's Guide", 9th Edition, McGraw-Hill Education, 2022.

2. Allen B. Downey and Chris Mayeld, "Think Java: How to Think Like a Computer Scientist", 2nd Edition, O'Reilly Media Publishers, 2020.

Reference Books

1. Herbert Schildt, "Java: The Complete Reference", 12th Edition, McGraw Hill Publisher, 2022.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme

Components	IA	MID SEM	End Sem	Total
Weightage (%)	50	20	30	100

Detailed breakup of Internal Assessment

Internal Assessment Component	Weightage in calculation of Internal Assessment (100 marks)
Quiz 1	15%
Quiz 2	15%
Class Test 1	15%
Class Test 2	15%
Assignment 1/Project	20%
Assignment 2/Project	20%

Course Code	Course name	L	T	P	C
CSEG2120	Object Oriented Programming Lab	0	0	2	1
Total Units to be Covered:11		Total Contact Hours: 30			
Prerequisite(s):	Programming in C Lab	Syllabus version: 1.0			

Course Objectives

1. Design and code the programs using java concepts.
2. Utilize the flexibility and modularity provided by OOPs using Java.
3. Implement Exception handling and Multithreading in Java
4. Develop server side applications using design patterns and data base connectivity

Course Outcomes

At the end of this course student should be able to

CO 1. Demonstrate object-oriented concepts using Java Language.

CO 2. Implement programs in Java using packages, interfaces and exceptions.

CO 3. Apply strings, threads and collections in Java.

CO 4. Develop server side applications using JSP, servlet and JDBC

CO-PO Mapping

Program Outcomes Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	2	-	2	-	-	-	-	-	-	-	1	3	-
CO 2	1	2	2	2	2	-	-	-	-	-	-	-	1	3	-
CO 3	1	2	2	1	2	-	-	-	-	-	-	-	1	3	-
CO 4	1	2	2	-	2	-	-	-	-	-	-	-	1	3	-
Average	1	2	2	.75	2	-	-	-	-	-	-	-	1	3	-

1 – Weakly Mapped (Low) **2 – Moderately Mapped (Medium)**

3 – Strongly Mapped (High) **“_” means there is no correlation**

List of Experiments

Experiment 1	Introduction to Java Environment
Experiment 2	Basic Java Programming
Experiment 3	Basic Java Programming
Experiment 4	Inheritance
Experiment 5	Interface
Experiment 6	Package
Experiment 7	Exceptions
Experiment 8	Strings Handling and Wrapper Class
Experiment 9	Threads and Collections
Experiment 10	JDBC
Experiment 11	Servlets

Total Lab hours 30

Textbooks

1. Ken Arnold, and James Gosling, "The Java Programming Language", 3rd Edition, Pearson, 2018.

2. Khalid Mughal, "A premier guide to SCJP", 3rd Edition, Pearson.

3. Bruce Ackel, "Thinking in Java", 3rd Edition, Pearson.

4. Video resources http://www.youtube.com and blackboard.

Reference Books

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme

Components	Quiz & Viva	Performance & Lab Report
Weightage (%)	50	50