

DAYANANDA SAGAR COLLEGE OF ENGINEERING

Shavige Malleshwara Hills, Kumaraswamy Layout, Bengaluru-560 078
An Autonomous Institute Affiliated to Visvesvaraya Technological University, Belagavi



Scheme and Syllabus
of
BACHELOR OF ENGINEERING (B.E)
in
COMPUTER SCIENCE AND BUSINESS SYSTEMS

V Semester
(2022 Scheme)

ACADEMIC YEAR 2024-25

**Department of Computer Science and Business Systems
Dayananda Sagar College of Engineering
Bangalore-560078**

VISION OF THE INSTITUTE

To impart quality technical education with a focus on Research and Innovation emphasizing on Development of Sustainable and Inclusive Technology for the benefit of society.

MISSION OF THE INSTITUTE

- 1) To provide an environment that enhances creativity and Innovation in pursuit of Excellence.
- 2) To nurture teamwork in order to transform individuals as responsible leaders and entrepreneurs.
- 3) To train the students to the changing technical scenario and make them to understand the importance of Sustainable and Inclusive technologies.

VISION OF THE DEPARTMENT

To create a competent learning ecosystem that deepens and advances the understanding of technology and management to develop innovative, principled, and insightful leaders who change the world

MISSION OF THE DEPARTMENT

- 1) To imbibe analytical and critical thinking skills for problem-solving.
- 2) To inculcate best teaching-learning practices.
- 3) To create an ecosystem for innovation, multidisciplinary research and skill enhancement in disruptive technologies.
- 4) To collaborate with industry partners to make students industry-ready.
- 5) To develop professional leaders with good values and ethics



DAYANANDA SAGAR COLLEGE OF ENGINEERING
B.E. in Computer Science and Business Systems (CSBS)
Scheme of Teaching and Examinations 2022
 Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
 (Effective from the academic year 2024-25)

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD)and Question Paper Setting Board (PSB)	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	22CB51	Software Engineering	TD: CB PSB: CB	3	0	0	03	50	50	100	3
2	IPCC	22CB52	Computer Networks	TD: CB PSB: CB	3	0	2	03	50	50	100	4
3	IPCC	22CB53	Artificial Intelligence & Machine Learning for Business	TD: CB PSB: CB	3	0	2	03	50	50	100	4
4	PCCL	22CBL54	Devops Lab	TD: CB PSB: CB	0	0	2	03	50	50	100	1
5	PEC	22CB55X	Professional Elective Course-I	TD: CB PSB: CB	3	0	0	03	50	50	100	3
6	AEC	22RM56	Research Methodology and IPR	TD: Any PSB: EC	2	2	0	02	50	50	100	3
7	HSMS	22ES57	Environmental Studies	TD: Any PSB: Civil Engg.	2	0	0	02	50	50	100	2
Total					16	2	6		350	350	700	20
Professional Elective Course-I												
22CB551		Marketing Research & Marketing Management			22CB553		ERP					
22CB552		JAVA for Business Applications			22CB554		Cloud Computing and its Business Applications					

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 :** The letter in the course code indicates common to all the stream of engineering. **PROJ:** Project /Mini Project. **PEC:** Professional Elective Course

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.

Mini Project - II: Mini Project is a laboratory-oriented/hands-on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to a group having not more than 4 students. The group of the mini project should be framed and guide should be allocated at the first week of the fifth semester. The final evaluation of the Mini Project – II will be done at the end of sixth semester.

MOOCs – Courses are to be selected from - NPTEL/SWAYAM/COURSERA/EDx/UDEMY/UDACITY. Can be taken from 5th sem to 7th sem and should be related courses of 5-7 semester. The course selected should be approved by respective HoD and has to be completed before completion of VII semester and the prescribed credits are added in VII semester. Students have to compulsorily submit the certificate after completion of the course to the Department. This is considered as a head of passing and is mandatory for the award of degree. Those, who do not take-up/complete the requirement, will be declared as failed and the degree will not be awarded.

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.

Course Title: Software Engineering			
Course Code:	22CB51	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	04
Course Learning Objectives: CLO 1. Identify ethical and professional issues and explain why they are of concern to software engineers. CLO 2. Recognize the importance of software maintenance and describe the intricacies involved in software evolution. CLO 3. Apply estimation techniques, schedule project activities and compute pricing. CLO 4. Identify software quality parameters and quantify software using measurements and metrics. CLO 5. Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility			
Module-1			
Introduction: Software Engineering Ethics. Case Studies, Software Process Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. Requirements Engineering: Requirements Engineering Processes. Requirements Elicitation and Analysis, Functional and non-functional requirements, The software Requirements Document, Requirements Specification, Requirements validation, Requirements Management.			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
System Models: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. Design and Implementation: Introduction to RUP, Design Principles, Object-oriented design using the UML, Design patterns, Implementation issues, Open source development.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
Software Testing: Development testing, Test-driven development, Release testing, User testing, Test Automation. Software Evolution: Evolution processes, Program evolution dynamics, Software maintenance			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
Project management: Risk management, Managing People, Teamwork, PERT and CPM Techniques Project Planning: Software pricing, Plan-driven development, Project scheduling: Estimation techniques, COCOMO Model Quality management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		

Module-5	
Agile Software Development: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods	
Teaching- Learning Process	Chalk & board, Active Learning, MOOC
Course Outcomes (Course Skill Set):At the end of the course the student will be able to: CO 1. Design a software system, component, or process to meet desired needs within realistic constraints. CO 2. Assess professional and ethical responsibility CO 3.Function on multi-disciplinary teams CO 4. Use the techniques, skills, and modern engineering tools necessary for engineering practice CO 5. Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems	
Textbook: 1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.	
Reference Books: 1. Roger S. Pressman, “Software Engineering-A Practitioner's approach”, Tata McGraw Hil, 7th Edition 2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.	
Weblinks and Video Lectures (e-Resources): 1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview 2. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)	

Course Title: Computer Networks			
Course Code:	22CB52	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours(Theory) + 12hrs Practical	Credits	04
Course Learning Objectives: CLO 1. Fundamentals of data communication networks. CLO 2. Software and hardware interfaces CLO 3. Application of various physical components and protocols CLO 4. Communication challenges and remedies in the networks			
Module-1			
INTRODUCTION : Overview of the Internet– Network Types, Switching- Circuit switching, Packet switching, The Internet, Accessing the Internet, Protocol Layering: Scenarios, TCP/IP Protocol Suite, Functions of each layer, The OSI Model, Internet History : Early History Birth of the Internet, Internet Today, Standards and Administration			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
NETWORK LAYER: Introduction: Network-Layer Services, Structure of A Router Network Layer Protocols: IPv4, Datagram Format, IPv4 Addresses, Classful addressing, Classless addressing , Subnetting, IP Address space management: DHCP – NAT ICMPv4, Unicast Routing , General Idea, Routing Algorithms			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
NETWORK LAYER: Distance Vector Routing, RIP, Link State Routing, OSPF, APPLICATION LAYER : Introduction: Providing Services, Application-Layer Paradigms: Client-Server , Peer-to-peer, Application Programming Interface, Sockets, Using Services of the Transport Layer , Standard Client-Server applications: World Wide Web and HTTP, Domain Name System (DNS), Need, Hierarchy, DNS Resolution, additional services			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
TRANSPORT LAYER – Introduction, Transport-Layer Services Transmission Control Protocol (TCP) : TCP Services, Features, Segment, Connection management, Windows in TCP, Flow Control, Error Control, Congestion Control, Timers, User Datagram Protocol			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		
Module-5			
DATA LINK LAYER : Introduction, Data link services, Error detection – Cyclic Redundancy Check, Link layer addressing, ARP, Wired LAN: Building blocks: Connecting devices : Repeaters or Hubs, Link-Layer Switches, Self-learning principle of LAN Switch, Routers, Virtual LANs- Need, different types of VLANs.			

Teaching- Learning Process	Chalk & board, Active Learning, MOOC, Problem based Learning.
Course Outcomes (Course Skill Set) At the end of the course the student will be able to: CO 1. Learn the basic needs of communication systems. CO 2. Interpret the communication challenges and its solution. CO 3. Identify and organize the communication system network components CO 4. Design communication networks for user requirements.	
Textbooks: 1. Behrouz A Forouzan, Firouz Mosharraf (2012)- Computer Networks (A Topdown Approach)- Special Indian Edition, Pearson 2. James F Kurose, Keith W (2012), Computer Networking (A Top-down approach),6th Edition, Pearson	
Reference Books: 1. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER	
Weblinks and Video Lectures (e-Resources): 1. https://nptel.ac.in/courses/106/101/106101060/ 2. https://www.digimat.in/nptel/courses/video/106105183/L01.html 3. http://www.digimat.in/nptel/courses/video/106105081/L25.html	
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning 1. Simulation of Personal area network, Home area network, achieve QoS etc.	
LAB COMPONENTS (Use NS2 Simulator) 1. Implement three nodes point – to – point networks with duplex links between them for different topologies. Set the queue size, vary the bandwidth, and find the number of packets dropped for various iterations. 2. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP. 3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion 4. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and plot congestion windows for different source/destination. 5. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets. 6. Write a program for error detecting code using CRC-CCITT (16- bits). 7. Write a program for congestion control using a leaky bucket algorithm. 8. Write a program for a simple RSA algorithm to encrypt and decrypt the data.	

Course Title: Artificial Intelligence & Machine Learning for Business			
Course Code:	22CB53	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hrs+12hrs of Practical	Credits	04
Course Learning Objectives:			
CLO 1. To study the concept of Artificial Intelligence and problem solving.			
CLO 2. To figure out advanced problem solving paradigms and knowledge representation.			
CLO 3. To explore neural networks, build neural networks to solve various classification problems			
Module-1			
Introduction, Problem Solving: state space search and control strategies: Introduction, General problem solving, Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative Deepening, Constant satisfaction.			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
Problem reduction and Game playing, Logic concepts and logic programming: Introduction, Problem reduction, Game playing, Bounded look ahead strategy and Use of, Alpha-Beta Pruning, Two –player perfect information games. Propositional calculus, Propositional logic, Natural Deduction system, Axiomatic system, Semantic tableau system in propositional logic, resolution refutation in propositional logic, Predicate logic, Logic programming			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
Advanced problem-solving paradigm: planning- types of planning systems, Block world problem, logic based planning, Linear planning using a goal stack, Means-ends analysis, Non –linear planning strategies. Knowledge representation: Approaches to knowledge representation, knowledge representation using semantic network, Extended semantic networks for KR, Knowledge representation using frames.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
Uncertainty Measure: Probability Theory, Bayesian Belief Networks, Machine Learning Paradigms: Machine learning system, supervised and unsupervised learnings, Inductive, deductive learning, Clustering			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		
Module-5			
Support vector Machine, case-based reasoning and learning. ANN: Single Layer, Multilayer. RBF, Design issues in ANN, Recurrent Network			
Teaching- Learning Process	Chalk & board, Active Learning, MOOC		

Practical Components:

1. Implement A* Search algorithm.
2. Implement AO* Search algorithm
3. Implement candidate Elimination algorithm.
4. Implement ID3 algorithm.
5. Backpropagation Algorithm.
6. Naive Bayesian Classifier Algorithm.
7. EM Algorithm
8. KNN Algorithm.
9. Regression Algorithm

Course Outcomes (Course Skill Set)

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

- CO 1. identify problems for AI. Characterize the search techniques to solve problems and recognize the scope of classical search techniques.
- CO 2. Define knowledge and its role in AI. Demonstrate the use of Logic in solving AI problems (can be attained through assignment and CIE).
- CO 3. Demonstrate handling of uncertain knowledge and reasoning in probability theory. (can be attained through assignment and CIE).
- CO 4. Have knowledge of Learning methods

Text Book(s)

1. Artificial Intelligence, Saroj Kaushik Cengage Learning 2014 Edition.

Reference Book

1. Artificial Intelligence: Structures and Strategies for Complex Problem Solving, George F Luger Pearson Addison Wesley 6 th Ed, 2008.
2. Artificial Intelligence, E Rich, K Knight, and S B Nair Tata Mc-Graw Hill 3rd Ed, 2009.
3. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig Prentice Hall 3rd, 2009.

Course Title: DevOps Lab			
Course Code:	22CBL54	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	Exam Hours	03
Total Hours of Pedagogy	15	Credits	01
Course Learning Objectives:			
CLO1. To explore the fundamental concepts in Project Life Cycle.			
CLO2. To develop skills using tools of DevOps.			
CLO3. To examine the application development with different automation tools.			
List of Experiments			
The students will be able to perform the following for said application :			
1. To perform the GIT operations: to create a repository and to perform fetch, pull, and branching operations. 2. To implement Code, Build, Test, Configure & Monitor the Software Applications with DevOps. 3. Build & Test Applications with Continuous Integration: To Install and Configure Jenkins to test, and deploy Java or Web Applications 4. Version Control: To Perform Version Control on websites/ Software's using different Version control tools like RCS/CVS/GIT/Mercurial 5. Virtualization & Containerization: To Install and Configure Docker for creating Containers of different Operating System Image, deploy the application in to Docker 6. To Build, deploy and manage web or Java application on Docker			
Course Outcomes (Course Skill Set)			
At the end of the course the student will be able to:			
CO1. Understand version control systems,			
CO2. Implement the solution to the problem			
CO3: Deployment of application in production environment			
CO4. Use of modern tools like Puppet and Ansible			
Textbooks:			
1. Joakim Verona. "Practical Devops", Second Edition. Ingram short title; 2nd edition, 2018. 2. Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint". Wiley publications, 2019.			
Reference Books:			
1. Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective". Addison Wesley, 1st Edition, 2015.			

Course Title: Marketing Research and Marketing Management			
Course Code:	22CB551	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course Learning Objectives:			
CLO 1. To understand basic marketing and market research concepts.			
CLO 2. To comprehend the dynamic nature of marketing.			
CLO 3. To analyze how the various components of marketing interact with each other.			
CLO 4. To implement marketing concepts for effective management of resources for marketing.			
CLO 5. To evaluate basic concepts and application of statistical tools in Marketing research			
Module-1			
Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in the 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			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
Product Management Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
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.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative 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.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		

Module-5	
Internet Marketing & Business-to-Business marketing: Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing. Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy	
Teaching- Learning Process	Chalk & board, Active Learning, MOOC, Problem based Learning.
Course Outcomes (Course Skill Set) At the end of the course the student will be able to: CO 1. Familiar with the basic concepts of marketing CO 2. Apply the various marketing strategies based on the market needs. CO 3. Analyze the difference in 4Ps of Business marketing CO 4. Evaluated the performance of customer relationship management	
Text Books: 1. Philip Kotler, Gary Armstrong and Prafulla Agnihotri, Principles of Marketing, Pearson India, 17th Edition. New Delhi: 2018 2. Rajan Saxena, Marketing Management, Tata-McGraw Hill, Fifth Edition New Delhi 2015 3. Malhotra, Naresh K. Marketing Research: An Applied Orientation. Upper Saddle River, NJ: Pearson/Prentice Hall, 2007. Print	
Reference Books: 1. C. B. Gupta and Dr. N. Rajan Nair, Marketing Management: Text and Cases 15th Edition, S. Chand and Sons 2012 2. N Rajan Nair and Sanjith R Nair, Marketing – Revised Edition, Sultan Chand & Sons 2017	

Course Title: JAVA in Business Applications			
Course Code:	22CB552	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course Learning Objectives:			
CLO 1. To learn primitive constructs of the JAVA programming language.			
CLO 2. To use JAVA concepts for application design			
CLO 3. To implement multi threads and exceptions			
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.			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
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)			
Practical : Design Simple Java application			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, this Keyword, Garbage Collection. Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes.			
Practical : Design Java application using classes and methods			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
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, Use static Methods in an Interface, Private Interface Methods			
Practical : Design Java application to illustrate the inheritance and interfaces			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		
Module-5			

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
Practical : Design Java application to illustrate exceptions and error handling.

Teaching- Learning Process	Chalk & board, Active Learning, MOOC.
----------------------------	---------------------------------------

Course Outcomes (Course Skill Set)

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

- CO 1. Demonstrate proficiency in writing simple programs involving branching and looping structures.
- CO 2. Apply the concepts of inheritance, multithreading, autoboxing, enumerations and interfaces in solving real world problems.
- CO 3. Analyze the various methods for design of applications.
- CO 4. Design JAVA application for the given scenario using modern tools.

Textbooks:

- 1. Java: The Complete Reference, Twelfth Edition, by Herbert Schildt, 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. Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)
- 3. 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/>

Weblinks and Video Lectures (e-Resources):

- 1. Java Tutorial: <https://www.geeksforgeeks.org/java/>
- 2. Java Tutorial: <https://www.w3schools.com/java/>
- 3. Java Tutorial: <https://www.javatpoint.com/java-tutorial>

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

- 1. Installation of Java Toolkit
- 2. Design of simple Java applications
- 3. Draw class diagrams using CASE tools

Course Title: Enterprise Resource Planning			
Course Code:	22CB553	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course Learning Objectives: CLO 1. To understand the basic concept of ERP systems CLO 2. To study the steps and activities in the ERP life cycle CLO 3. To develop a process driven thinking towards business processes			
Module-1			
Introduction to ERP: Evolution of ERP; What is ERP? Reasons for the Growth of ERP; Scenario and Justification of ERP in India; Evaluation of ERP; Various Modules of ERP; Advantage of ERP. An Overview of Enterprise: An Overview of Enterprise; Integrated Management Information; Business Modeling; ERP for Small Business; ERP for Make to Order Companies; Business Process Mapping for ERP Module Design; Hardware Environment and its Selection for ERP Implementation.			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
ERP and Related Technologies: ERP and Related Technologies; Business Process Reengineering (BPR); Management Information System (MIS); Executive Information System (EIS); Decision support System (DSS).			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
ERP Market: Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Co, System Software Associates, Inc. (SSA); QAD; A Comparative Assessment and Selection of ERP Packages and Modules.			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
ERP Implementation Lifecycle: Issues in Implementing ERP Packages; Pre-evaluation Screening; Package Evaluation; Project Planning Phase; Gap Analysis; Reengineering; Configuration; Implementation; Team Training; Testing; Going Live; End-User Training; Post Implementation (Maintenance Mode). Selection of ERP Vendors: Vendors; Consultants and Users; In-House Implementation - Pros and Cons; Vendors; Consultants; End User			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		
Module-5			
Future Directions in ERP: New Markets; New Channels; Faster Implementation Methodologies; Other Related Technologies of SCM: E-Procurement; E-Logistics; Internet Auctions; E-markets; Electronic Business Process Optimization; Business Objects in SCM; E commerce			
Teaching- Learning Process	Chalk & board, Active Learning, MOOC		
Course Outcomes (Course Skill Set) At the end of the course the student will be able to:			

- CO 1. Understand the need of Business Systems and Processes through strategic analysis of ERP systems
- CO 2. Demonstrate a good understanding of the basic issues in ERP systems
- CO 3. Analyze the strategic options for ERP identification and adoption
- CO 4. Design the ERP implementation strategies

Textbooks:

1. The Impact of Enterprise Systems on Corporate Performance: A study of ERP, SCM, and CRM System Implementations [An article from: Journal of Operations Management] by K.B. Hendricks; V.R. Singhal; and J.K. Stratman, Publisher: Elsevier

Reference Books:

1. Manufacturing Resource Planning (MRP II) with Introduction to ERP; SCM; and CRM by Khalid Sheikh, Publisher: McGraw-Hill
2. ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI
3. Implementing SAP ERP Sales & Distribution by Glynn C. Williams, Publisher McGraw-Hill

Course Title: Cloud Computing and Business Applications			
Course Code:	22CB554	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course Learning Objectives:			
CLO 1. The fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges			
CLO 2. Cloud storage technologies and relevant distributed file systems			
CLO 3. The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations			
Module-1			
Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.			
Teaching- Learning Process	Problem based Learning, Chalk & board, Active Learning.		
Module-2			
Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, Managing the Cloud Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-3			
Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning.		
Module-4			
Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service and Queue service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM Cloud models, Sales force			
Teaching- Learning Process	Chalk & board, Active Learning, Problem based Learning		
Module-5			
Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform Security in Cloud Computing: Cloud in Information Technology, Cloud General Challenges, Security Aspects, Data Security, Virtualization Security, Network Security, Platform-Related Security, Security Issues in Cloud Service Models			
Teaching- Learning Process	Chalk & board, Active Learning, MOOC		
Course Outcomes (Course Skill Set)			
At the end of the course the student will be able to:			
CO 1. Understand various service delivery models of a cloud computing architecture.			

CO 2. Apply the cloud services and deploy

CO 3. Analyze various cloud programming models and apply them to solve problems on the cloud.

Textbooks:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, 2011.

Course Title: Research Methodology and IPR			
Course Code:	22RM56	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course Learning Objectives:			
CLO 1. To identify the importance of research.			
CLO 2. To understand the research methodology, tools and techniques.			
CLO 3. To interpret the results of Research and Propose recommendations.			
CLO 4. To understand Intellectual Property rights.			

Module	Course Contents	Hours	COs
1	Meaning, Objectives and Characteristics of research - Research methods vs Methodology - Types of research -Descriptive Vs. Analytical, Applied Vs. Fundamental, Quantitative Vs. Qualitative, Conceptual Vs. Empirical - Research process - Criteria of good research – Developing a research plan, Case Study and Practice Session.	8	CO1, CO2, CO3
2	Defining the research problem- Selecting the problem- Necessity of defining the problem - Techniques involved in defining the problem-Importance of literature review in defining a problem-Survey of literature-Primary and secondary sources-Reviews, treatise, monographs - patents-web and source- searching the web-Identifying gap areas from literature review- Development of working hypothesis, Case Study and Practice Session.	8	CO2, CO3
3	Research design and methods –Research design–Basic Principles-Need of research design– Features of good design, Development of Models-Developing a research plan-exploration, Description, Diagnosis, and Experimentation – Determining experimental and sample designs, Sampling design -Steps in sampling design-Characteristics of good sample design-Types of sample designs- Measurement and scaling techniques- Methods of data collection -Collection of primary data-Data collection instruments Testing of hypotheses-Basic Concepts-Procedure for hypotheses testing flow diagram for hypotheses testing. Case Study and Practice Session.	8	CO1, CO2, CO3
4	Interpretation and report writing- Techniques of interpretation-Structure and components of scientific reports- Different steps in the preparation – Layout, structure and language of the report - Illustrations and tables- Types of report-Technical reports and thesis, Case Study and Practice Session IPRs- Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Invention and Creativity –Intellectual Property-	8	CO1, CO4

	Importance and Protection of Intellectual Property Rights (IPRs), Case Study and Practice Session.		
5	A brief summary of: Patents, Copyrights, Trademarks, Industrial Designs-Integrated Circuits – Geographical Indications — Application and procedures. World Intellectual Property Organization (WIPO): Introduction, Origin of WIPO, Salient Features of WIPO, Main Activities of WIPO, India and WIPO, Access to International IP Filing Systems, Protection of Traditional Knowledge (TK), Indian web portals for patents & technologies, Case Study and Practice Session.	8	CO1, CO4

Course Outcomes: After completion of the course, the graduates will be able to ...

CO1	Outline the importance of conducting research, and Intellectual property rights
CO2	Analyze different types of research problem and criteria for good research.
CO3	Examine features and importance of research design including collection and sampling of data
CO4	Develop Intellectual property rights documents and technical reports.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2					2	2	2		1
CO2	3	3	3	2				2	2	2		1
CO3	3	3	3	2	1			2	2	2		1
CO4	3	2	3	2	2			2	2	2		1

Note: AAT components must be given to satisfy attainment of PO 8, 9 and 10

Weightage values: 3 – Strongly matched, 2 – moderately matched, 1 – weakly matched, (---) not matched.

Note:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self-Study Components:

Module 1 : Understand the combination of both qualitative and quantitative methods.

Module 2 : Learn how to identify and articulate research problems.

Module 3 : Learn how to conduct a thorough literature review to support your research.

Module 4 : Study how to develop testable hypotheses.

Module 5 : Parliamentary Standing Committee Report on IPR Regime and Addressing IP Crimes.

Text Books:

1	“Research Methodology: Methods and Techniques” (4 th Edition, 2019) by Kothari, C.R., New Age International.
2	“Intellectual Property A Primer for Academia” (1 st Edition, 2021) by Prof. Rupinder Tewari Ms. Mamta Bhardwaj.
3	"Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" (6th Edition, 2023) by John W. Creswell and J. David Creswell
4	"Research Methodology: A Step-by-Step Guide for Beginners" (4th Edition, 2023) by Ranjit Kumar
5	"Intellectual Property Rights in an Age of Electronics and Information" (2023) by John V. Martin

Reference Books:

1	"Statistics with R: A Beginner's Guide" (2023) by Robert N. Stinerock
2	"Research Methods in Education" by Louis Cohen, Lawrence Manion, and Keith Morrison (9th Edition, 2023):
3	"Intellectual Property in the New Technological Age: 2023" by Peter S. Menell, Mark A. Lemley, and Robert P. Merges
4	"Research Handbook on Intellectual Property and Moral Rights" edited by Paul Torremans (2023)

On-Line Materials & Resources (Video experiments / You-tube Videos / Virtual labs / Demo experiments videos, etc...):

1	https://link.springer.com/book/10.1007/978-981-19-5441-2
2	https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview
3	https://ayushnext.ayush.gov.in/index.php/detail/writeUps/national-level-workshop-on-research-methodology-and-ipr
4	https://onlinecourses.nptel.ac.in/noc23_ge36/preview