Shri Shankaracharya Technical Campus, Bhilai
(An Autonomous Institute Affiliated to CSVTU Bhilai)
Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Updated on
13-04-2023

SCHEME OF EXAMINATION

B. Tech- 3rd Year								Semester: 6th	
Branch: Computer Science and Engineering									

S.N.	Subject Name	Subject Code	Periods per week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
			L	T	P	ESE	CT	TA		
1	Compiler Design	CS102601	3	1	-	100	20	30	150	4
2	Software Engineering & Agile	CS102603	3	0	-	100	20	30	150	3
3	AI and Machine Learning	CS109604	2	1	-	100	20	30	150	3
4	Professional Elective -II	Refer Table -II	3	0	-	100	20	30	150	3
5	Open Elective - I	Refer Table-I	3	0	-	100	20	30	150	3
6	Cloud Computing Lab	CS102691	-	-	2	25	-	25	50	1
7	Software Engineering Lab (Software Testing)	CS102693	-	--	2	25	-	25	50	1
8	AIML Lab	CS109692	-	-	2	25	-	25	50	1
9	Minor Project -II	CS102694	-	-	2	50	-	25	50	1
11	Essence of Indian Knowledge and Tradition	CS100695	-	-	-	-	-	25	25	-
	Total		13	2	10	625	100	275	1000	20

Professional Elective -II		
Sr. No.	Subject Code	Name of Subject
1.	CS116621	Smart Contract
2.	CS102622	Enterprise Resource Planning
3.	CS102623	Object Oriented Modeling And Design
4.	CS102624	Mobile Computing
5.	CS113625	Data Analytics Using R Programming

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards

Subject Code CS102601	Compiler Design		L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE		CT	TA	Total	ESE Duration
	100		20	30	150	3 Hours
	Minimum number of class tests to be conducted=02				Minimum Assignments=02	

Course Objectives	Course Outcomes
• To provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science. • To understanding the fundamental principles in compiler design.	After undergoing the course, students will be able to: 1. Explain the concepts of Compilers and roles of the lexical analyzer. 2. Apply the concepts of different Parsing techniques and implement the knowledge to Yacc tool. 3. Develop syntax directed translation schemes. 4. Implement the principles of scoping, parameter passing and runtime memory management. **5.** Use the new code optimization techniques to improve the performance of a program in terms of speed & space and develop algorithms to generate code for a target machine.

UNIT I: Introduction : Introduction to Compiler, single and multi-pass compilers, Translators, Phases of Compilers, Compiler writing tools, Finite Automata and Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer with LEX.

UNIT II: Syntax Analysis and Parsing Techniques : Context free grammars, Bottom-up parsing and top down parsing, Top down Parsing : elimination of left recursion, recursive descent parsing, Predicative Parsing, Bottom Up Parsing : Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables, Construction of SLR parse tables for Ambiguous grammar, parser generator- YACC, error recovery in top down and bottom up parsing.

UNIT III: Syntax Directed Translation & Intermediate Code Generation : Synthesized and inherited attributes, Construction of syntax trees, bottom up and top down evaluation of attributes, S-attributed and L attributed definitions ,Postfix notation; Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expression and Procedure Calls.

UNIT IV: Run-time Environment : Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation.

			1.00	Applicable for AY 2021-22 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

UNIT V: Code Optimization and Code Generation : Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issue in the design of Code generator, register allocation, the target machine, and simple Code generator.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Compilers Principles, Techniques and Tools	Alfred V. Aho, Ravi Sethi and Ullman J.D	Addison Wesley
2	Principle of Compiler Design	Alfred V. Aho and J.D. Ullman	Narosa Publication

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Compiler Techniques	J.P. Bennet	Tata McGraw-Hill
2	Compiler construction (Theory and Practice)	A. Barret William and R.M., Bates	Galgotia Publication
3	Compiler Design	O.G. Kakde	Laxmi Publication

Subject Code CS102603	Software Engineering and Agile	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
1. To introduce software project and to understand about the different software processes & To introduce ethical and professional issues and to explain why they are concern to software engineers 2. Understanding good coding practices, including documentation, contracts, regression tests and daily builds. 3. Their uses. To understand how Software engineering & Project Management is concerned with theories, methods and tools for professional software development.	After completion of this course, the students would be able to : 1. Developing some basic level of software architecture/design 2. Extracting and analyzing software requirements specifications for different projects 3. Select and implement different software development process models 4. Defining the concepts of software quality and reliability on the basis of International quality standards. 5. Analyzing software risks and risk management strategies 6. Applying different testing and debugging techniques and analyzing their effectiveness. **7.** Defining the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress.

UNIT I: Introduction, Software- problem and prospects Software development process: Software life cycle models, Open source software development, the unified process, documentation, configuration management, Safety, risk assessment.

UNIT II: Measures, Metrics and Indicators, Metrics in the Process and Project Domains, Software Measurement, Metrics of Software Quality, S/W reliability, Software estimation techniques, loc and FP estimation. Empirical models like COCOMO, project tracking and scheduling, reverse engineering.

UNIT III: Software requirements and specification: feasibility study, Informal/formal specifications, pre/post conditions, algebraic specification and requirement analysis models, Specification design tools. Software design and implementation: Software design objectives, design Like, Top-Down, bottom-up, team etc. techniques, User interface design, modularity Functional decomposition Data flow design, Data structure design, Object-oriented design, Design patterns implementation strategies.

 UNIT IV: Coding standard and guidelines, programming style, code sharing, code review,

software components, rapid prototyping, specialization, construction, class extensions, intelligent software agents, reuse performance improvement, debugging. Software Testing Strategies: Verification and Validation, Strategic Issues, test plan, white box, black-box testing, unit and integration testing, system testing test case design and acceptance testing, maintenance activities.

UNIT V: Agile Vs Traditional SDLC Models, Phases of Agile Model, Principles of Agile model, Agile Model - Pros and Cons, , When to use the Agile Model? , Agile Testing Methods, Scrum, Product Backlog, Scrum Practices, Process flow of Scrum Methodologies, extreme Programming (XP), Phases of eXtreme programming, Crystal Methodologies, Dynamic Software Development Method (DSDM), Feature Driven Development (FDD), Lean Software Development, KANBAN, Agile metrics.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering: A Precise Approach	PANKAJ JALOTE	Wiley India
2	Software Engineering Concepts	Fairley Richard	TMH

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering	Ian Sommer ville	Pearson Education Inc
2	Software Engineering: A Practitioners Approach	Roger S. Pressman	McGraw-Hill

Subject Code CS109604	AI and Machine Learning	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of this course is to familiarize the prospective engineers with different kinds of Learning techniques and get acquainted with the basics of machine learning methods and model validation methods and ways to measure their accuracy.	On successful completion of the course, the student will be able to: **CO1** : Get deep insight of AI and its problem Solving techniques. **CO2**: Represent information or knowledge through various representation techniques. **CO3** : Understand various classification and Regression techniques **CO4** : Understand various clustering methodologies and its evaluation process **CO5** : Validate, understand and analyze the different Machine learning curves and performance evaluation methods

UNIT-I Introduction to machine learning, Machine learning life cycle, Types of Machine Learning System (supervised and unsupervised learning, reinforcement learning, Batch and online learning, Instance-Based and Model based Learning), scope and limitations (Advantages of ML), Challenges of Machine learning, data visualization, hypothesis function and testing, data pre-processing, data augmentation, normalizing data sets, Bias-Variance trade-off, Relation between AI (Artificial Intelligence), ML (Machine Learning), DL (Deep Learning) and DS (Data Science).

UNIT-II Regression and Classification algorithm: - Linear Regression, Logistic Regression, Linear Classification, perceptron Update rule, Perceptron convergence, generalization, Maximum Margin classification, Classification errors, regularization Bayesian Networks, Learning Bayesian Networks Decision Tree Classification, Neural Network, K-Nearest Neighbours' (K-NN), Support Vector Machine, Naive Bayes (Gaussian, Multinomial, Bernoulli). Performance Measures: Confusion Matrix, Classification Accuracy, Classification Report: Precisions, Recall, F1 score and Support. ,

UNIT-II Clustering in Machine Learning: Types of Clustering Method: Partitioning Clustering, Distribution Model-Based Clustering, Hierarchical Clustering, Fuzzy Clustering. Birch Algorithm, CURE Algorithm. Gaussian Mixture Models and Expectation Maximization. Parameters estimations – MLE, MAP. Applications of Clustering. Spectral Clustering, Markov Models, Hidden Markov Models(HMM), Probabilistic inference, Collaborative filtering.

UNIT-IV Ensemble Learning and Random Forest: Introduction to Ensemble Learning, Basic Ensemble Techniques (Max Voting, Averaging, Weighted Average), Voting Classifiers, Bagging and Pasting, Out-of-Bag Evaluation, Random Patches and Random Subspaces, Random Forests (Extra-Trees, Feature Importance), Boosting (AdaBoost, Gradient Boosting), Stacking.

UNIT-V Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction (Projection, Manifold Learning) PCA: Preserving the Variance, Principal Components, Projecting Down to d Dimensions, Explained Variance Ratio, Choosing the Right Number of Dimensions, PCA for Compression, Randomized PCA, Incremental PCA. Kernel PCA: Selecting a Kernel and Tuning Hyper parameters. Learning Theory: PAC and VC model.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Tom M. Mitchell	McGraw-Hill Education (India) Private Limited
2	Introduction to Machine Learning (Adaptive Computation and Machine Learning)	Ethem Alpaydin	MIT Press
3	Machine Learning: An Algorithmic Perspective	Stephen Marsland	CRC Press
4	Pattern Recognition and Machine Learning	Bishop, C.	Springer-Verlag

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Artificial Intelligence and Expert Systems	Dan W.Patterson	Prentice Hall of India.
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (First Edition)	Aurelien Geron	O'Reilly Media
3	Dive into Deep Learning	Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola	E-Books
4	Machine Learning for Humans	Vishal Maini ,Samer Sabri	E-Books

Subject Code CS102691	Cloud Computing Lab	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
1. To provide students with the fundamentals and essentials of Cloud Computing. 2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.	After the completion of this course, the students will be able to: 1. State Cloud fundamentals & its application. 2. Describe the architecture of cloud & various solutions. 3. Paraphrase virtualization technologies & describe cloud management. 4. Explain cloud security fundamentals. 5. Apply various cloud platforms like Google App Engine, Hadoop etc.

- Cloud computing overview , - What is Infrastructure as a Service (IaaS), What is Platform as a Service (PaaS), What is Software as a Service (SaaS)
- Cloud computing models ,Advantages of using cloud , AWS Global Infrastructure, AWS Shared Responsibility Model
- AWS Elastic Cloud Compute (EC2)
- AWS Pricing Calculator
- Create Linux Instance , - Using Putty to connect to Linux Instance, Implement Apache Web Server on Linux Instance
- Create Windows Instance
- Tools Used For Accessing Cloud
- Elastic Block Storage (EBS), Simple Storage Service (S3)
- Elastic File System (EFS)
- Relational Database Service (RDS)
- Security and Compliance concepts
- DynamoDB
- Create and Use Custom AMI
- Virtual Private Cloud (VPC)
- Deploy Application in Custom VPC using best practices
- Elastic Load Balancer (ELB)
- Application Load Balancer (ALB)
- Network Load Balancer (NLB)
- Identity and Access Management (IAM)
- Well-Architected Framework
- AWS CloudWatch and SNS
- AWS CloudFront
- Auto Scaling
- AWS Route 53

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- Docker and containers Hands on
- Elastic Container Service (ECS)
- Elastic Container Registry (ECR)
- Elastic Kubernetes Service (EKS)
- Amazon Lightsail

Text Books:

S. No.	Title	Author(s)	Publisher
1			
2			

Reference Books:

S. No.	Title	Author(s)	Publisher
1			
2			

Subject Code CS102693	Software Engineering Lab (Software Testing)	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The goal of this course is to teach and provide experience building software projects in service to real-time end-user beneficiaries. The laboratory is pursued in the following sequence of stages with due coordination with co-projectees in teams (of 3–4 students) and supervision of laboratory instructor upon which the project is graded accordingly.	After undergoing the course, students will be able to 1. Define various software application domains and remember different process model used in software development. 2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques. 3. Convert the requirements model into the design model and demonstrate use of software and user-interface design principles. 4. Justify the role of SDLC in Software Project Development and evaluate importance of Software Engineering. 5. Generate project schedules, deliverables and construct, design and develop network diagram for different type of projects; also practicing the activities of each phase.

List of experiments

1. Python Basics
2. Python Programming examples
3. Python Data types
4. Python OOPS Examples
5. Selenium Locators
6. Selenium Multi Browser Execution
7. Python Selenium API Methods
8. Advanced Selenium User interactions
9. End to end Practise Examples to Automate
10. PyTest - Unit Testing Framework
11. PyTest Fixtures
12. PyTest Parameterization
13. PyTest Annotations, Command Line Arguments

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14. Python PyTest Reports
15. Log4J Logging Python
16. Page object Model Design Pattern
17. End to end Framework design from scratch
18. Python Data driven Framework using Excel
19. Pyxl Examples with Selenium Integration
20. Jenkins CI Integration
21. GITHUB Version control Management

Text Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering: A Precise Approach	PANKAJ JALOTE	Wiley India
2	Software Engineering Concepts	Fairley Richard	TMH

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Software Engineering	Ian Sommerville	Pearson Education Inc
2	Software Engineering: A Practitioners Approach	Roger S. Pressman	McGraw-Hill

Subject Code CS109692	Artificial Intelligence and Machine Learning Lab	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of class tests to be conducted=02		Minimum Assignments=02		

Course Objectives	Course Outcomes
The objective of this course is to familiarize the prospective engineers with different kinds of Learning techniques and get acquainted with the basics of machine learning methods and model validation methods and ways to measure their accuracy.	On successful completion of the course, the student will be able to: **CO1** : Get deep insight of AI and its problem Solving techniques. **CO2**: Represent information or knowledge through various representation techniques. **CO3** : Understand various classification and Regression techniques **CO4** : Understand various clustering methodologies and its evaluation process **CO5** : Validate, understand and analyze the different Machine learning curves and performance evaluation methods

Experment List

1. Implement linear regression using python
2. Write a Program to implement the naive bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier few test data sets.
3. Implement an algorithm to demonstrate the significance of genetic algorithm
4. Write a program to implement K-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
5. Implementation of the BIRCH algorithm using python.
6. Implementation of the cure algorithm using python code
7. Write a program using Bagging for a classification problem.
8. The probability that it is Friday and that a student is absent is 3%. Since there are 5 school days in a week, the probability that it is Friday is 20%. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result.(Ans: 15%)
9. Implement clustering Algorithm in python
10. Write a program to Implementing a Random forest classifier
11. Write a program to demonstrate the working of the decision tree-based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
12. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
13. Python Implementation of Support Vector Machine.
14. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
15. Implement and demonstrate a program for dimensionality reduction.

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Tom M. Mitchell	McGraw-Hill Education (India) Private Limited
2	Introduction to Machine Learning (Adaptive Computation and Machine Learning)	Ethem Alpaydin	MIT Press
3	Machine Learning: An Algorithmic Perspective	Stephen Marsland	CRC Press
4	Pattern Recognition and Machine Learning	Bishop, C.	Springer-Verlag

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Artificial Intelligence and Expert Systems	Dan W.Patterson	Prentice Hall of India.
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (First Edition)	Aurelien Geron	O'Reilly Media
3	Dive into Deep Learning	Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola	E-Books
4	Machine Learning for Humans	Vishal Maini ,Samer Sabri	E-Books

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards

Subject Code CS109694	Minor Project - II Lab	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes

Subject Code CS109696	Essence of Indian Knowledge and Tradition	L = 0	T = 0	P = 2	Credits = 0
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	-	-	25	25	-
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards

Subject Code CS116621	Smart Contract		L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE		CT	TA	Total	ESE Duration
	100		20	30	150	3 Hours
	Minimum number of class tests to be conducted = 02				Minimum Assignments = 02	

Course Objectives	Course Outcomes
1. To understand the Smart Contracts in Blockchain. 2. To learn the tools and programming skills required to generate Smart Contracts. 3. To assess the efficiency of the security issues.	After the completion of this course, the students will be able to: 1. Understand the basics and objectives of Smart Contracts in a Blockchain. 2. Evaluate the various functionalities and features in an Ethereum to generate Smart Contracts. 3. Introduce the Solidity language in creation of a Smart Contracts. 4. Incorporate Smart Contracts in decentralized applications. 5. Assess the security issues and effectiveness of a Smart Contracts in real world scenarios.

Unit 1: Fundamentals of Smart Contracts **Blockchain Terminologies -** Cryptocurrency and Smart Contracts - Understanding the Virtual Machine of a Blockchain - Terminology, concepts and practices in Smart Contracts. **Ethereum Smart Contracts** Definition of Ethereum - Prevalence of the Ethereum blockchain in Smart Contracts development - Ethereum Virtual Machine (EVM) - Instances of working Ethereum Smart Contracts.

Unit 2 Various Aspects in **Application of Smart Contracts** - Market impact and scientific innovation – Trust - Security, using Merkle Trees – Future resistance features in Smart Contracts applications - Workflow of developing a Smart Contracts - Execution environments in writing a Smart Contracts.

Unit 3: Solidity Language Basics Layout of a Solidity Source File - Structure of a contracts - Control structures – Functions - Scoping and declarations. **Solidity with Contracts** Creating contracts - Object-oriented high level language features - Visibility and Getters – Events - Abstract Contracts.

Unit 4: Decentralized Applications Decentralized Application Architecture - Connecting to the Blockchain and Smart Contracts – Building dApps – Deployment.

Unit 5: Security Issues Shifting from Trust-in-People to Trust-in-Code - Data permanence - Selective-Obscurity - Security counter measures. Contemporary Issues

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Ethereum Smart Contracts Development in Solidity	Gavin Zheng, Longxiang Gao, Liqun Huang, Jian Guan	Springer Singapore
2	Introducing Ethereum and solidity	Dannen, C.	Berkeley: Springer

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and Blockchain	Modi, Ritesh	Packt Publishing Ltd

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards

Subject Code CS102622	Enterprise Resource Planning	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
• To know the basics of ERP and business modules of ERP • To understand the key implementation issues of ERP • To be aware of some popular products in the area of ERP • To appreciate the current and future trends in ERP	On successful completion of the course, the student will be able to: • CO1: Students will know the strategic importance of Business models. • CO2: Students will able to know about the working of different modules in a manufacturing company • CO3: Students will understand the information system used in any company • CO4: Students will understand the business model and implementing ERP • CO5: Students will learn to use commercial ERP packages • CO6: Students will understand basic concepts, tools and techniques of Enterprise Resource Planning.

UNIT 1:
INTRODUCTION: ERP: An Overview, Enterprise – An Overview, Origin, Evolution and Structure: Conceptual Mode of ERP, The Benefits of ERP, ERP and Related Technologies, Business Process Reengineering(BPR), Data Warehousing, Data Mining, OLAP, Product Life Cycle Management(PLM), Supply Chain Management(SCM).

UNIT 2:
ERP IMPLEMENTATION: ERP Implementation Lifecycle, Implementation Methodology, Hidden Costs, Organizing the Implementation, Role of SDLC/SSAD, Object Oriented Architecture Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring.

UNIT 3:
THE BUSINESS MODULES: Business modules in an ERP Package, Finance, Manufacturing, Human Resources, Bills of Materials, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution, MRP , MRP II.

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UNIT 4:

THE ERP MARKET: ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.
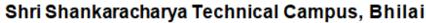
UNIT 5:

ESENT AND FUTURE: ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture Using ERP tool: ERP Market Place, SAP AG, PeopleSoft, Baan, JD Edwards, Oracle, QAD, SSA.Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP and Internet, Future Directions

Text Books:

S. No.	Title	Author(s)	Publisher
1	ERP Demystified	Alexis Leon	Tata McGraw Hill
2	Enterprise Resource Planning Concepts and Practice	Vinod Kumar Garg & N. K. Venkitakrishnan	Prentice Hall of India Private Limited

Reference Books:

S. No.	Title	Author(s)	Publisher
1	ERP	Devan Parag	Excell Publishers
2	Frontiers of E-Commerce	Kalkota Ravi & B. Whinston	Addison Wesley
3	Concepts in Enterprise Resource Planning	Joseph A Brady, Ellen F Monk, Bret Wagner	Thompson Course Technology

Subject Code CS102623	Object Oriented Modeling And Design	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
- Understand the basic steps of Object Oriented Analysis and Design. - Gain practical knowledge in the UML diagrams and notations. - Build an object-oriented model for a project using UML.	Upon completion of this course student will be able to- **CO1**. Understand basic object-oriented concepts for designing a solution. **CO2**. Apply an iterative, use case-driven process to the development of a robust design model. **CO3**. Use the UML to represent the design model. **CO4**. Apply the OO concepts abstraction, encapsulation, inheritance, hierarchy, modularity, and polymorphism to the development of a robust design model. **CO5**. Design a software system using object-oriented software engineering paradigm.

UNIT I: Introduction and Modeling Concepts

Introduction- What is Object-Orientation? What is Object-Oriented Development?, Object-Oriented themes, Evidence for usefulness of Object-Oriented Development, OO Modeling history.

Modeling Concepts: Modeling as design technique-Modeling, Abstraction, The three Models. Class Modeling- Object and Class, Links and Associations Concepts. Generalization and Inheritance, A Sample Class Model, Navigation of Class Models. Advanced Class Modeling –Advanced Objects and Class Concepts, Association ends, N-array associations, Aggregation, Abstract Classes, Multiple Inheritance, Metadata, Reification, Constrains, Derived Data, and Packages.   **[7 Hrs.]**

UNIT II: State Modeling and Interaction Modeling

State Modeling- Events and States, Transition & Conditions, State diagrams, State diagram behavior, Nested State diagrams, Concurrency. Advanced State Modeling- Nested State diagram, Nested States, Signal Generalization, Concurrency, A Sample State Model, Relation of Class and State Models. Interaction Model- Use Case Models, Sequence Models, Activity Models. Advanced Interaction Modeling- Use Case relationships, Procedural Sequence Models, Special Constructs for activity Models.   **[7 Hrs.]**

UNIT III: Analysis and Design

Process Overview- Development Stages, Development Life cycle. System Conception- Developing a System concept, Elaborating a Concept, Preparing a Problem statement. Domain Analysis- Overview of Analysis, Domain Class Model, Domain State Model, Domain Interaction Model, Iterating and Analysis. Application Analysis- Application Interaction Model, Application Class Model, Application State Model, Adding Operations.   **[7 Hrs.]**

UNIT IV: System design and class Design

System design: Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identifying Concurrency, Allocating Subsystems, Management of Data Storage, Handling Global Resources, Choosing Software Control Implementation, Handling Boundary Conditions, Setting Trade-off Priorities, Common Architectural Styles, Architecture of the ATM System.

Class design: Overview of Object Design, Bridging the gap, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance,

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Organizing a Class Design, ATM Example	**[8 Hrs.]**

UNIT V: Implementation

Implementation Modeling- Overview of Implementation, fine-tuning classes, Fine tuning generalizations, realizing Associations, Testing. OO Languages- Introduction, Abbreviated ATM Model, Implementing Structure, Implementing Functionality. Databases- Introduction, Abbreviated ATM Model, Implementing Structure-basic and advanced, Implementing Structure for the ATM Example, Implementing functionality, OO Databases. Programming Style-OO Style, Reusability, Extensibility, Robustness, Programming in-the-large.   **[7 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Object – Oriented Modeling and Design with UML	Michael R Blaha and James R Rumbaugh	Pearson Education, India
2.	Object oriented systems development	Ali Bahrami,	McGraw-Hill Higher Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Object Oriented Analysis & Design	Atul Kahate	Tata McGraw-Hill Education
2.	Object-Oriented Analysis and Design with Applications	Grady Booch, Robert A. Maksimchuk Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston	Addison-Wesley Professional

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Subject Code CS102624	Mobile Computing	L = 2	T =1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	Course Outcomes
• To introduce the fundamental design principles & issues in cellular & mobile communications. • To enable the student to understand the basic features of cellular-mobile communication systems and digital radio system. • To motivate students to understand the different technology for working of mobile devices, their advantages and disadvantages and emerging problems.	**After successful completion of the course students will be able to:** **CO1**. Understand the basic physical-layer architecture of a mobile communication system. **CO2**. Understand various multiple-access techniques for mobile communications, and their advantages and disadvantages. **CO3**. Understand the concepts of wireless communication techniques **CO4**. Understand the concepts of ADHOC networks. **CO5**. Students will be able to acknowledge about the working and development of mobile and wireless devices in detail, services provided by them and recent application development trends in this field.

Unit- I Introduction, Cell Coverage & Frequency Management
Mobile and wireless devices, Frequencies for radio transmission, A basic cellular system, Cell Size. Elements of cellular radio systems, Design and Interference, Concept of frequency reuse, cell splitting, Channels, Multiplexing, Access Techniques, Medium Access control, Spread spectrum, Specialized MAC, Cell Throughput,, Co-channel interference reduction factor, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.   [7 Hrs.]

Unit- II GSM Architecture & Services
GSM Services and Features, GSM System Architecture, GSM Radio Subsystem, GSM Channel Types, Example of a GSM Call, Signal Processing in OSM, Channel Coding for Data Channels, Channel Coding for Control Channels, Frequency and Channel Specifications. New Data Services: DECT Functional Concept, DECT Radio Link, Personal Access Communication Systems, PACS System Architecture, PACS Radio Interface, UMTS   [7 Hrs.]

UNIT-III: Wireless Networks
Wireless LAN, Hidden Nodes in Wireless Networks, Ordered MAC Techniques and Wireless Networks, Deterministic MACs for Wireless Networks, Comparison Of MAC Techniques for Wireless Networks; Infrared V/S Radio Transmission; IEEE 802.11, Architecture, Layers, Management; HIPERLAN; Bluetooth; Wireless Broadband (WiMAX), RFiD, Java Card., WLL.   [7 Hrs.]

UNIT-IV: Mobile network and Transport layer
Mobile Network Layer; Mobile IP, DHCP, ADHOC Networks; Mobile Transport Layer; Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP; Fast Transmit/Fast Recovery, Transmission/Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.   [7 Hrs.]

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UNIT–V: Mobile System Development and Support: Wireless Application Protocol (WAP) – WAP Model, WAP Gateway, WAP Protocols WAP User Agent Profile and Caching, Wireless Bearers for WAP, WAP Developer Toolkits, Mobile Station Application Execution Environment Third-Generation Mobile Services - Paradigm Shifts in Third-Generation Systems W-CDMA and cdma2000, Improvements on Core Network, Quality Service in 3G Wireless Operating System for 3G Handset, Third- Generation Systems and Field Trials, Other Trial Systems, Impact on Manufacture and Operator Technologies.   **[8 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Mobile Communications	Schiller, Jochen	Pearson Education Asia – Addison WesleyLongman PTE. Ltd.
2	Wireless Communication Principles and Practice	Theodore S Rappaport	Pearson Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Mobile Data Wireless LAN Technologies	Dayem, Rifaat A	Prentice Hall Internationa
2.	The Essential Guide to Wireless Communication Applications	Dornan, A	PearsonEducation Asia.
3.	The Wireless Application Protocol	Sandeep Singhal	Pearson Education Asia
4.	Third Generation Mobile Telecommunication systems	P. Stavronlakis	Springer Publishers

			1.00	Applicable for AY 2021-22 Onwards
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Subject Code CS113625	Data Analytics Using R Programming	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
1. Learn Fundamentals of R 2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions. 3. Cover the Basics of statistical data analysis with examples. 4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.	After the completion of this course, the students will be able to: 1. Understand the basics of Fundamentals of R. 2. Understands the loading, retrieval techniques of data. 3. Understand how data is analysed and visualized using statistic functions.

UNIT I Introduction to R :What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed. packages(), package Description(), help(), find. package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

UNIT II R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

 UNIT III R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors,

generating factor levels gl().

UNIT IV   Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

UNIT V   Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.

Text Books:

S. No.	Title	Author(s)	Publisher
1	R Programming for Beginners	Sandip Rakshit	McGraw Hill Education (India)
2	Data Analytics using R	Seema Acharya	McGrawHill Education (India)

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Tutorials Point (I) simply easy learning	Online Tutorial Library (2018)	https://www.tutorialspoint.com/r/r_tutorial.pdf
2	R for Dummies	Andrie de Vries, Joris Meys	John Wiley and Sons

Subject Code CS100643	Cloud Computing	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
1. To provide students with the fundamentals and essentials of Cloud Computing. 2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.	After the completion of this course, the students will be able to: 1. State Cloud fundamentals & its application. 2. Describe the architecture of cloud & various solutions. 3. Paraphrase virtualization technologies & describe cloud management. 4. Explain cloud security fundamentals. 5. Apply various cloud platforms like Google App Engine, Hadoop etc.

UNIT I Introduction: Historical development ,Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, its advantages and limitations, Cloud and dynamic infrastructure, Cloud Adoption and rudiments.

Unit-II Cloud Computing Architecture: Cloud Reference Model, Concept of IaaS, PaaS, SaaS, AaaS, BaaS, FaaS, DaaS, STaaS, CaaS, NaaS, DBaaS, AaaS, aPaaS, iPaaS, apimPaaS, IoT PaaS, mPaaS, dbPaaS, and UIPaaS, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Virtual Desktop Infrastructure. Fog computing, Mist(Edge) computing

Unit –III Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management , Conceps of Map reduce , Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute ,storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN) and Virtual SAN(VSAN) and their benefits .

Unit-IV Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, **Cloud Security:** Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Secutity Architecture .

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Unit-V Market Based Management of Clouds , Federated Clouds/Inter Cloud: Characterization & Definition ,Cloud Federation Stack , Third Party Cloud Services . Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CRM and ERP ,Social networking .

Case study : Google App Engine, Microsoft Azure , Hadoop , Amazon , Aneka

Text Books:

S. No.	Title	Author(s)	Publisher
1	Mastering Cloud Computing	Buyya, Selvi	TMH Pub
2	Cloud Computing	Kumar Saurabh	Wiley Pub

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Cloud Security	Krutz , Vines	Wiley Pub
2	Cloud Computing- A Practical Approach	Velte	TMH Pub
3	Cloud Computing	Sosinsky	Wiley Pub

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Subject Code CS100644	Digital Marketing	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
1. To provide students with the fundamentals and essentials of Digital Marketing Concepts and tools available. 2. To provide students a sound foundation of the Digital marketing tools so that they are able to start using and adopting these tools in their real life scenarios.	After the completion of this course, the students will be able to: 1. State Digital Marketing fundamentals. 2. Describe the architecture of marketing & various solutions. 3. Paraphrase digital marketing tools & describe tools management. 4. Explain and enhance fundamental strategies. 5. Apply various tools for web analytics.

Unit 1: Introduction to Digital Marketing, Digital Marketing vs traditional marketing, Importance of digital marketing, recent trends and current scenario of the industry, Marketing Automation, Influencer & Podcast, Web Remarketing, Design Essentials, Video Marketing The Art of Pitching

Unit 2: Search Engine Optimization (SEO), Search Engine Marketing, search engine's results page (SERP), on-page and off-page optimization, keywords research, meta tags, meta description, link building, search volume, cost-per-click (CPC), customer lifetime value (CLV), call-to-action (CTA). cost-per-view (CPV), cost-per-impression (CPM),

Unit 3: Social Media Marketing Using different social media platforms like Facebook, Instagram, YouTube, Twitter, LinkedIn, Pinterest, Google+, Snapchat, etc. Email Marketing : create and send product-based emails in bulk, open rate and conversion rate. Affiliate Marketing, Content Marketing & Strategy, Web Remarketing, Mobile Marketing, Adsense, Blogging, Video Marketing

Unit 4: Web Analytics based on traffic source, referring sites, page views, and conversion rates of that website. E-Commerce Management Maintenance of an online product-listing website through product keyword research, product pricing, positive reviews, and customer retention. Online Reputation Management (ORM)

Unit 5: Planning and Creating a Website, Design Essentials, Digital Media Planning and Buying, create a website on WordPress. Content Strategy: How to create content that matches the user intent and also your business goals. E-Commerce Management, Art of Pitching, ROI, cost-per-install (CPI), cost-per-order (CPO), cost-per-acquisition (CPA), click-through-rate (CTR) etc.

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Digital Marketing Essentials You Always Wanted to Know	Self-Learning Management Series	**John Wiley & Sons Inc**
2	Digital Marketing For Dummies	Ryan Deiss & Russ Henneberry	**John Wiley & Sons, Inc**

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Digital Marketing 2020	Danny Star	*Edureka*
2	Social Media Marketing All-in-one Dummies	Jan Zimmerman, Deborah Ng	**John Wiley & Sons Inc**

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards