DEPARTMENT OF TECHNOLOGY
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester – V (Computer Science and Technology)

To be implemented from Academic Year 2022 - 23

Sr. No	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
		L	T	P	Credits	Theory			Practical		
						Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
CS311	System Programming	3	-	-	03	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS312	Design and Analysis of Algorithm	3	1	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS313	Operating System	3	-	-	03	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS314	Machine Learning	3	-	-	03	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS315	Database Engineering	3	1	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS316L	Free Open Source Software Lab	-	-	2	01	-	-	-	EOE	50	20
CS315L	Database Engineering Lab	-	-	2	01	-	-	-	EPE	50	20
CS317L	Java Programming Lab	2	-	4	04	-	-	-	IPE	50	20
									EPE	50	20
CS318	Seminar	-	-	2	01	-	-	-	IOE	50	20
CS319	Internship-I	-	-	-	01	-	-	-	IOE	50	20
	Total	17	02	10	25	**-**	**500**	**-**	**-**	**300**	**-**
Audit Course											
RM 311	Research Methodology	02	-	-	-	Institute Level	-	-	-	-	-

Total Credits: 25 Total Contact Hours/Week: 31hrs

Note:

1. Minimum 40% marks must be secured in SEE to pass that head.
2. Students are expected to do self-study for two hours as per the guide hence contact hours to be taken as two for the calculation of contact hours
3. **Internship – I and Mini Project** shall include
   - **a.** Internship of minimum four (4) weeks should be done after SY (Semester IV) in summer vacation and it's assessment will be done in TY (Semester V) based on report submitted. – Credit 01
   - **b.** Executing a mini project and delivering a presentation with mini project report. - Credit 01

Work load of the assessment both (a) and (b) shall be assigned to the mini project seminar guide.

CIE –Mid Semester Evaluation, SEE – Semester End Examination,

IPE – Internal Practical Evaluation, EPE–External Practical Examination,

IOE– Internal Oral Evaluation, EOE–External Oral Examination

Note: There will be an industrial tour/ visit based on the course requirement during semester V. The report of the visits during the tour is required to be submitted by the students.

DEPARTMENT OF TECHNOLOGY
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester – VI (Computer Science and Technology)

To be implemented from Academic Year 2022 - 23

Sr. No	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
CS321	Compiler Construction	3	1	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS322	Advanced Operating System	3	1	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS323	Object Oriented Modelling and Design	4	-	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS324	Computer Graphics and Multimedia Techniques	4	-	-	04	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS325	Engineering Economics	3	-	-	03	CIE	30	40	-	-	-
						SEE	70		-	-	-
CS323L	Object Oriented Modelling and Design Lab	-	-	2	01	-	-	-	EOE	50	20
CS324L	Computer Graphics and Multimedia Techniques Lab	-	-	2	01	-	-	-	IPE	50	20
									EPE	50	20
CS326L	Advanced Programming Lab	2	-	2	03	-	-	-	IPE	50	20
									EPE	50	20
CS327	Mini Project	-	-	2	01	-	-	-	IOE	50	20
	Total	**19**	**02**	**08**	**25**	-	**500**	-	-	**300**	-
Audit Course											
HS321	Introduction to Foreign Language	02	-	-	-	-	-	-	-	-	-

Total Credits: 25 Total Contact Hours/Week: 31hrs

Note:

#: Minimum 40% marks must be secured in SEE to pass that head.

* Students are expected to do self-study for two hours as per the guidance given by the project guide hence contact hours to be taken as two for the calculation of contact hours.

Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.

CIE –Mid Semester Evaluation, SEE – Semester End Examination,

IPE – Internal Practical Evaluation, EPE–External Practical Examination,

IOE– Internal Oral Evaluation, EOE–External Oral Examination

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part -III Sem- V**					
Course Title	**:**	**System Programming**			**Course Code**	**:**	CS311
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	03
		Tutorial	00 Hours/Week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	The knowledge of Computer Organization and Programming.					
Course Domain	**:**	Core (Assembler, Compiler, Interpreter)					

Course Rationale: System software is a collection of system programs. It plays a role in the effective servicing of user's computational needs on computer system. The servicing includes all activities such as creation of programs and it's processing by the computer, system editing, storage, translation, relocation, linking and eventual execution. System programs such as Assembler, Complier, Interpreter, Macro processor, Linker and Loaders offers such services. The subject will introduce to the students the fundamentals knowledge of all such system software's

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Conceptualize the fundamentals of language specifications.	1.	Identify different types of system software and language specifications.
2.	Provide the knowledge of different passes of assemblers	2.	Design one pass and two pass assembler and working.
3.	Demonstrate how assembler handles macros calls.	3.	Design and Develop assembler for macro expansion.
4.	Provide the knowledge of how compiler and interpreter works	4.	Describe working, advantages and disadvantages of compiler and interpreter.
5.	Give the knowledge of how compiler loads program in memory for execution and how it linksmacros	5.	Describe how program gets loaded into memory at the time of execution.
6.	Familiarize with various software development tools.	6.	Understand different programming environment and deployment tools.

Curriculum Content	**Hours**
Unit I **Language Processors :** Introduction, Language processing activities, Fundamentals of language processing, Fundamentals of language specification, Language processor development tools.	05
Unit II **Assemblers:** Elements of assembly language programming, a simple assembly scheme, pass structure ofassemblers,	08

design of a two pass assembler, a single pass assembler for IBM PC.	
Unit III **Macro Processors:** Macros facility, Macro definition and call, Macro Expansion, Nested macro calls, Advancedmacro facilities, Design of macro preprocessor.	06
Unit IV **Compilers and Interpreters** : Aspects of compilation, memory allocation, compilation of expressions, compilation ofcontrol structures, code optimization, Interpreters.	07
Unit V **Linkers & Loaders :** Relocation and linking concepts, design of a linker, Self-relocating programs, a linker for MSDOS, Linking for overlays, Loaders.	08
Unit VI Software Tools Software tools for program development, Editors, Debug monitors, ProgrammingEnvironments, User interfaces, DLLs.	05

Suggested Text Books:	
1.	System Programming and Operating Systems", D. M. Dhamdhere, TMGH, 2nd Edition.
Suggested Reference Books:	
1.	"System Programming", J. J. Donovan, Mc-Graw Hill.
2.	"Systems Programming" by A A Puntambekar and I A Dhotre
3.	"System Programming and Compiler Construction (Includes Labs)" by R K Maurya and Anand A Godbole

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology), Part III, Sem-V**					
Course Title	**:**	Design and Analysis of Algorithm			**Course Code:**	**:**	CS312
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		**Total Credits**	**:**	4
		Tutorial :	01 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	**Duration of SEE**	**:**	3 hrs
Revision:	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (if any)	**:**	Programming Language, Data Structure, Mathematical Logic					
Course Domain	**:**	**Core (Algorithm)**					

Course Rationale: To develop an understanding of the various aspects of computer algorithms. The subject will introduce the fundamentals of algorithms, different designing paradigms of algorithm and analysis any algorithm. In this students will study and understand basics of Computer algorithm and will able to design and analyse the algorithm. It will educate the student with different techniques of algorithm designs and also select best suitable technique.

Course Objectives: The Course teacher will		Course Outcomes: Students will be able to	
1	Expose students to fundamentals of algorithms.	**1**	Describe fundamentals of algorithms. Determine time complexity and space complexity of a given algorithm. Discover solution to problems using algorithm design technique like Divide and conquer
2	Provide knowledge about different algorithm design paradigms.	**2**	Discover solution to problems using algorithm design paradigms like Greedy Approach, Dynamic Approach
3	Provide details of different asymptotic Analysis	**3**	Analyse performance of algorithms using asymptotic analysis.
4	Provide knowledge about various non-linear data structure and different operations on them.	**4**	Apply algorithms for performing operations on graphs and trees.
5	Provide detail knowledge concept of backtracking and P, NP and NP Complete Problems	**5**	Apply concept of backtracking algorithm. Understand basic concepts of Complexity theory
6	Provide knowledge about selected Algorithms from various application areas like number theory	**6**	Formalize and understand selected Algorithms from various application areas like number theory

Curriculum Content	**Hours**
Unit 1 Introduction and Divide and Conquer **Introduction**: Introduction, Characteristics of algorithms, Pseudo code Conventions, Recursive Algorithms, Performance analysis, Asymptotic notations (O, Ω, Θ), Performance measurement, Recurrence relations.	08

Divide and Conquer– General method, Binary search, finding the maximum and minimum, Merge sort, Quick sort, Selection	
Unit II The Greedy method General method, , Knapsack problem, Job sequencing with deadlines, minimum-cost spanning trees – Prim's and Kruskal's Algorithms, Optimal storage on tapes , Optimal merge patterns, Huffman codes Single source shortest paths.	07
Unit III Dynamic Programming General method, Multistage graphs, All pair shortest paths, Optimal binary search trees, Reliability design, Traveling Sales person problem	07
Unit IV Basic Traversal and Search Techniques Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal, Depth First Search & Traversal, Connected components and Bi-connected components	05
Unit V Backtracking and basic of Complexity problems **Backtracking –** General method, n-queen problem, Permutation tree, Sum of subsets, Hamiltonian Cycle, and Graph Coloring **NP Hard and NP Complete Problems –** Basic Concepts, P, NP, NP Complete, NP Hard	06
Unit VI Selected Algorithms from various areas String Matching: The naïve string-matching algorithm, The Robin-Karp algorithm, The Knuth-Morris-Pratt algorithm; Number -Theoretic algorithms: GCD algorithm, Chinese remainder theorem, Primality testing	06

Suggested Text Books:	
1.	Fundamentals of Computer Algorithms-Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, Universities Press.
2.	"Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, The MIT Press.
Suggested Reference Books:	
1.	The Design and Analysis of Computer Algorithms-A. Aho, J. Hopcroft and J. Ullman, 1st Edition, Addison-Wesley.
2.	Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN-13: 978-8120311312

Class, Part & Semester	**:**	**T. Y. B. Tech (Computer Science and Technology) Part-III, Sem-V**					
Course Title	**:**	Operating System			**Course Code**	**:**	CS313
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	03
		Tutorial	NA				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Data Structures, knowledge of C and Fundamentals of Computer Systems					
Course Domain	**:**	Core (Operating System)					

Course Rationale: An operating system is an interface between user and hardware and manages the allocation of computer hardware. The purpose of an operating system is to provide a platform on which a user can execute programs in a convenient and efficient manner. This course provides the fundamental concepts of operating system and it covers the internal process scheduling algorithms, including CPU scheduling, inter process synchronization and communication, memory management and I/O management.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1	Provide a clear understanding of the concepts of operating system with basic aspects.	**1**	Study the different types of operating systems.
2	Help to develop the conceptual understanding of process, process scheduling and synchronization.	**2**	Understand the basic concept of process and process scheduling algorithms used in operating system.
3	Help to develop the knowledge of inter process communication and synchronization	**3**	Understand concept of inter process communication and synchronization
4	Help to develop the understanding of deadlocks and to analyze them related to common circumstances in operating systems.	**4**	Give the extensive knowledge of memory management and deadlock handling algorithms.
5	Help to understand different approaches to memory management, virtual memory and different paging algorithm.	**5**	Analyze various algorithms required for management, scheduling, allocation and communication used in operating system.
6	Help to understand the overview of I/O system and kernel I/O subsystem.	**6**	Understand various concepts of I/O application and kernel I/O subsystem.

Curriculum Content	**Hours**
Unit: I Introduction What is an operating system?, Simple Batch System, Multi programmed Batch System, Time Sharing System, Personal Computer System, Parallel System, Real Time System, System Calls.	05
Unit: II Process Process Concept, Process Scheduling, Operation on process, Cooperating process, Threads, Inter process communication (Algorithm evaluation). Process Scheduling: Basic concept, Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling, real time scheduling	08
Unit: III Interprocess Synchronization Background, Classical problems of synchronization, Critical Region, The critical section problem, Synchronization Hardware Monitors, Semaphores.	05
Unit: IV Deadlocks System modes, Deadlock characterization, Methods for handling, deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, combined approach to dead lock.	07
Unit: V Memory Management Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory: Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, Thrashing, Demand segmentation.	09
Unit: VI I/O System Overview, I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O request to hardware operation	05

Suggested Text Books:

1.	"Operating System Concepts", Silberschatz Galvin, John Wiley, 5th Edition.

Suggested Reference Books:

1.	"Operating System Concepts and Design ", Milan Milenkovic TMGH Second Edition
2.	"Operating System A Design Oriented Approach", Charles Crowley, TMGH.

3.	"Operating System with Case Studies in Unix, Netware and Windows NT", Achyut S. Godbole, TMGH.

Class, Part & Semester	:	**Third Year B. Tech (Computer Science and Technology), Part-III, Semester- V**					
Course Title	:	**Machine Learning**			**Course Code**	:	CS314
Teaching Scheme (Hours)	:	Lecture	03Hours/Week		**Total Credits**	:	03
		Tutorial	00 Hours/Week				
Evaluation Scheme (Marks)	:	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	:	03 Hrs.
Revision	:	Fourth			**Month**	:	June 2022
Pre-requisites (If any)	:	Discrete Mathematics, Mathematics for Computer Science					
Course Domain	:	Cognitive					

Course Rationale:
Machine Learning is a key to develop intelligent systems and analyze data in science and engineering. The purpose of machine learning is to discover patterns in your data and then make predictions based on often complex patterns to answer business questions, detect and analyze trends and help solve problems. This course provides an introduction to the fundamental methods at the core of modern machine learning. It covers theoretical foundations as well as essential algorithms for supervised and unsupervised learning.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1	Explain Human learning aspects.	1	Explain machine learning concepts.
2	Explain primitives in learning process by computer.	2	Analyze the Machine learning model.
3	Demonstrate nature of problems solved with Machine Learning	3	Design solution using machine learning techniques.
4	Introduce students to the basic concepts and techniques of Machine Learning.	4	Characterize machine learning algorithms as supervised and unsupervised.
5	Explain strengths and challenges of machine learning	5	Apply machine learning techniques like classification, decision tress, naive Bayesian model and clustering
		6	Demonstrate concepts related to Recommendation System and Time series analysis

Curriculum Content	**Hours**
Unit I **Introduction to Machine Learning:** Definition, Terminology, Types of learning, Machine Learning Problem categories, Machine learning architecture, process, Lifecycle, Performance measures, tools and framework, data visualization.	6
Unit II **Regression:** Simple regression – hypothesis, cost function, parameter learning with gradient descent, learning rate, Gradient Descent for linear regression, examples, simple regression in matrix form. Multivariate Linear Regression – multiple features, hypothesis functions, Gradient Descent for multiple variables, Feature scaling, polynomial regression	8
Unit III **Classification- logistic regression & Neural Network:**	8

Definition, logistic regression – hypothesis representation, decision boundary, cost function, gradient descent for logistic regression. multiclass classification, Regularization - Overfitting & Underfitting, cost function, Regularized Linear Regression, Regularized Logistic Regression Neural Networks- Neuron representation and model, Hypothesis for neuron, cost function, solution of a problem using single neuron. Gradient descent for a neuron. Neural network, Multiclass classification with neural network. Learning in neural network-backpropagation algorithm	
Unit IV **Classification- Decision trees and Naïve Bayes** Decision trees: definition, terminology, the need, advantages, and limitations. constructing and understanding Decision trees, common problems with Decision trees, Decision tree algorithms, random forest, examples. Conditional probability and Naïve Bayes Classifier Instance-based classifier – K- Nearest Neighbour Classifier	6
Unit V **Unsupervised learning:** Clustering, K Means clustering, Hierarchical clustering, Association Rule mining	4
Unit VI **Recommendation System and Time series analysis** Basic Text Processing with Python, regular expression, Natural Language Processing, Text Classification, Topic modeling Popularity based recommender engines, Content based recommendation engines, Classification based recommendation engine, collaborative filtering Date and Time Handling, Window functions, Correlation, Time Series Forecasting	6

Suggested Text Books:	
1.	Machine Learning with Python- an approach to applied ML, by Abhishek Vijayvargia, BPB publications
2.	Practical Machine Learning by Sunila Gollapudi Packt Publishing Ltd.
3.	Machine Learning by Tom M. Mitchell, McGraw Hill Education; First edition
Suggested Reference Books:	
1.	Machine Learning for dummies John Paul Muller, Willey Publication
2.	EthemAlpaydin : Introduction to Machine Learning, PHI 2nd Edition-2013

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part – III Sem-V**					
Course Title	**:**	**Database Engineering**			**Course Code**	**:**	CS315
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	04
		Tutorial	01 Hours/Week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic knowledge of Programming.					
Course Domain	**:**	Core (Database , SQL , Transactions , Recovery)					

Course Rationale: Database Engineering help students to develop and design E-R models. The purpose of Database Engineering is to elaborate importance of schema design, normal forms etc. This course provide concepts of data storage and indexes, transaction processes, concurrency control. It covers foundation for storage structure and recovery system.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Help student to understand the role of a database management system in an organization.	1	Explain the features of database management systems and Relational database with applications.
2.	Demonstrate logical database design Principles including E-R diagrams.	2	Design conceptual models of a database using ER model for real life applications.
3.	Explain procedures connectivity, design and implement a small database project.	3.	Create and Design SQL for a real life application, with constraints and keys.
4.	Give overview of physical design of a database system.	4.	Formulate complex queries with data manipulation language to Database.
5.	Describe the concept of a database transaction, related facilities, , concurrency control, Backup and recovery	5.	Apply database normalization principals to analyze the existing design of a database schema and to design an optimal database.
6.	Introduce the recent trends in database technology.	6.	Create and construct indexing mechanisms for efficient retrieval of information.

Curriculum Content	**Hours**
Unit I **Introduction and Database Modeling using ER Model** General introduction to database systems and its advantages & applications, Database System Architecture, Database users and Administrator, Data models, Database management system, Database languages, View of Database, Data Models. ER Model, Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features of ER Model-Generalization, Specialization and aggregation	06
Unit II **Data Modelling and SQL:** Concept of relations, Schema-instance distinction, Referential integrity and foreign keys, Relational algebra, Various types of joins, Tuple relation calculus, Domain relational calculus, Example queries, Introduction to SQL, Data definition statements with constraints, Update behaviours, Nested Queries, Aggregate functions group by and having clauses.	07
Unit III **Database Design :** Importance of a good schema design, Motivation for normal forms, dependency theory - functional dependencies, Closure of a set of FD's, Definitions of 1NF, 2NF, 3NF and BCNF, Decompositions and desirable properties of them, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF.	06
Unit IV **Data Storage and Indexes :** File organizations, Primary, Secondary index structures, Various index structures - hash-based, Dynamic hashing techniques, Multi-level indexes, B+ tree indices, Multiple key access.	05
Unit V **Transaction Processing and Concurrency Control :** Concepts of transaction processing, ACID properties, Transaction states, Implementation of atomicity, isolation and durability, Serializability, Testing for serializability. Concurrency Control: Lock-based protocols, Timestamp - based Protocols, Validation - based Protocols, Multiple Granularities, Deadlock handling	10
Unit VI Recovery System Failure classification, Storage structure, Implementation of stable storage, Recovery and Atomicity, Log based recovery, Checkpoints, Shadow Paging, Buffer management in crash recovery.	05

Suggested Text Books:	
1.	Silberschatz A., Korth H., Sudarshan S. "Database System Concepts", 6th edition, Tata McGraw Hill Publishers
2.	G. K. Gupta "Database Management Systems" , Tata McGraw Hill
Suggested Reference Books:	
1.	Rab P., Coronel C. "Database Systems Design, Implementation and Management", 5th edition, Thomson Course Technology, 2002
2.	Elmasri R., Navathe S. " Fundamentals of Database Systems", 4th edition, Pearson Education, 2003
3.	Date C. " An Introduction to Database Systems", 7th edition, Pearson Education, 2002
4.	Ramkrishna R., Gehrke J. " Database Management Systems", 3rd edition, McGraw Hill

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Engineering), Part-III Sem-V**					
Course Title	**:**	**Free Open-Source Software Lab**			**Course Code**	**:**	CS316L
Teaching Scheme (Hours)	**:**	Practical	02 Hours/Week		**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**		EOE=50	Grand Total =50	**Duration of SEE**	**:**	--
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic Programming Languages					
Course Domain	**:**	**Cognitive**					

Course Rationale: Free Open-Source Software Lab focuses on giving students practical approach on building deployable machine learning models by offering an in-depth understanding of the three major types of machine learning algorithms, comprising of supervised, unsupervised, and reinforcement learning using the most widely used programming language.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Introduce open source software.	1.	Elaborate use of FOSS.
2.	Help student understand applications using FOSS.	2.	Build applications using FOSS.
3.	Describe FOSS strategy in SDLC.	3.	Inculcate FOSS strategy in SDLC to design and develop applications.
4.	Describe linear and Logistic regression models.	4.	Apply linear and Logistic regression models.
5.	Introduce various type of classification methods including SVM, Naive bayes, decision tree, and random forest	5.	Analyse Supervised methods.
6.	Describe unsupervised learning and learn to use clustering algorithms	6.	Implement unsupervised learning

Curriculum Content

In Open Source Lab – I, the student has to study 3-4 open source software tools. It should consist of combination of applications and system software which are free and open source. The student has to

perform 4 experiments based on basic python programming and 6 experiments separately on Machine learning using python or any suitable open source technology.

Suggested Reference Books:	
1.	"Core Java Fundamentals Vol –I", Cay S. Horstmann, Gary Cornell, The Sun Microsystems Press Java Series.
2.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent SystemsBy Aurélien Géron
3.	Introduction to Machine Learning with Python: A Guide for Data Scientist By Andreas C. Müller, Sarah Guido
4.	Deep Learning with Python*By Mike Krebbs*
5.	Learning Python, 5th Edition Mark Lutz,
6.	'Python Crash Course' by Eric Matthews

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology),Part III, Sem V**					
Course Title	**:**	**Database Engineering Lab**			**Course Code**	**:**	CS315L
Teaching Scheme (Hours)	**:**	Practical	2Hours/Week		**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**	IOE =Nil	EPE =50	Grand Total = 50	**Duration of EPE**	**:**	03Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Theoretical Knowledge of Database Engineering					
Course Domain	**:**	Core (Database , SQL , Transactions , Recovery)					

Course Rationale: Database Engineering Lab Focuses on designing of database for real life applications. Practical focuses on creating queries with SQL and applying normalization concepts to the database. Lab tries to design and implement indices and various protocols like concurrency control and database recovery protocol.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Describe foundation for ER Diagram and the usage of relational algebra	1.	Construct problem statements for real life applications and design a database for the same
2.	Introduce the concepts of basic SQL as a universal Database Query language.	2.	Design ER model for real life applications and to construct queries with Relational Algebra.
3.	Enable the design of an efficient database design principles using normalization concepts.	3.	Create and populate queries using SQL to query, update and retrieve information from the Database.
4.	Enable students to create indexes for databases.	4.	Analyse and apply concepts of normalization to existing database schema.
5.	Design and implement a small database project.	5.	Design and Implement indices for a database.
6.	Introduce the concepts of concurrency protocol and recovery protocol	6.	Design and Implement concurrency control protocol and database recovery protocol

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration.	
Sr. No.	**List of Experiments**
1.	Draw ER diagrams for different schemas & Convert them into tables (Assume any suitable schema). Apply normalization. Display constraints.
2.	Study of SQL.
3.	Design the relational database for any of the ER Model from assignment No.1 using SQL.
4.	Insert and Modify Database: Implement queries to insert, update data in tables created in assignment 3 and store data in separate File / Table.
5.	View Data: Design queries to view and retrieve table data.
6.	Canonical cover & Closure: For given set of functional dependencies to find canonical cover & closure.
7.	B+ Tree Indexing Technique: Write program to implement B+ Tree Index.
8.	Dynamic Hashing Technique: Write program to implement Dynamic Hashing on the created data.
9.	Concurrency Control: Write program to simulate any one concurrency control Protocol.
10.	Database Logs: Write program to create logs of the activities of assignment 3 & 4. Choose either Immediate Log or Deferred Log.
11.	Database Connectivity: Write a program to implement MySQL/Oracle database connectivity with any front end language to implement Database navigation operations (add, delete, edit etc.)
12.	Cursors (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor) Write a PL/SQL block of code using parameterized Cursor that will merge the data available in the newly created table N_Aadhar_Number with the data available in the table O_ Aadhar_Number. If the data in the first table already exist in the second table then that data should be skipped.
13.	Database Trigger (All Types: Row level and Statement level triggers, Before and After Triggers). Write a database trigger on Grocery Shop table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in Grocery Audit table.
14.	Unnamed PL/SQLcode block: Use of Control structure and Exception handling is mandatory
15.	Named PL/SQL Stored Procedure and Stored Function

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-V**					
Course Title	**:**	**Java Programming Lab**			**Course Code**	**:**	CS317L
Teaching Scheme (Hours)	**:**	Lecture	02 Hours/Week		**Total Credits**	**:**	04
		Practical	04 Hours/Week				
Evaluation Scheme (Marks)	**:**	IPE=50	EPE=50	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Knowledge of Programming Methodology, C, C++ or Object-Oriented language					
Course Domain	**:**	Core (Data Structures, Object Oriented Design & Programming)					

Course Rationale: This course provides concepts and fundamentals of platform independent object oriented language. The use of java programming is to develop the reusable programs, desktop and web applications.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Introduce fundamentals of programming ,Execution, methods, etc.	1.	Generate an application based upon the concepts of core java & advanced java.
2.	Introduce fundamentals of object-oriented programming in Java.	2.	Understand the structure and model of the Java programming language.
3.	Demonstrate principles of software development.	3.	Develop Java programs to implement error handling techniques using exception handling and develop programs using class and inputs from keyboard.
4.	Explain how to write a computer program to solve specified problems.	4.	Develop graphical User Interface using AWT
5.	Demonstrate use of java environment to run simple Java programs.	5.	Create and communicate between client and server using Java and create a good, effective and dynamic website.
		6.	Develop Java program using packages, inheritance and interface.

Curriculum Content	**Hours**
Unit I INTRODUCTION JAVA BASICS: Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.	3
Unit II ARRAY & STRING Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, Mutable & Immutable String, Using Collection Bases Loop for String, Tokenizing a String, Creating Strings using StringBuffer	4
Unit III INHERITANCE AND POLYMORPHISM INHERITANCE: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword. PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces. I / O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, File Handling.	6
Unit IV EXCEPTION HANDLING Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes. MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.	5
Unit V AWT CONTROLS The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll Pane, Menu, Scroll Bar. Working with Frame class, Colour, Fonts and layout managers. EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes, Inner classes.	4

Unit VI SWINGS Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel,JTextField, JTextArea, JList, JComboBox, JScrollPane.	4

General Instructions: Any 15 experiments to be performed from the list, any 2 experiments to be studied as demonstration

Sr. No.	List of Experiments
1	Implement java program to: a. To perform arithmetic operations on two numbers using switch statements. b. To find number is prime or not using for statement.
2	Write a program to find out day of the given date using command line argument.
3	Implement java program using Scanner class
4	Implement java program for one dimensional and two dimensional arrays.
5	Implement java program for Jagged array.
6	Implement java program to study concept of class.
7	Implement java program for method overloading & Constructor overloading.
8	Implement java program to perform string operations using string class
9	Implement java program to perform string operations using stringbuffer class
10	Write a Java program to demonstrate inheritance by creating suitable classes
11	Write a Java program to demonstrate use of- a. super keyword b. static keyword c. final keyword
12	Implement java program using abstract classes
13	Implement java program for method overriding.
14	Implement java program for implementing interface.
15	Write a program to implement mathematical package for arithmetic, statistical and trigonometric operations.
16	Write a program to develop java package for the stack class.
17	Implement java program for exception handling.
18	Implement concept of multithreading using java programming.
19	Implement java program for database connectivity with JDBC.
20	Implement java program for AWT
21	Implement java program for swing

Suggested Text Books:

1.	"Core Java Fundamentals Vol –I", Cay S. Horstmann, Gary Cornell, The Sun Microsystems Press Java Series.

2.	"Core Java Vol – II", Cay S. Horstmann, Gary Cornell, The Sun Microsystems Press Java Series.
3.	"Database Programming with JDBC and JAVA", Grorge Reese, O'REILLY
Suggested Reference Books:	
1.	"Java 2 Complete Reference", Herbert Schildt, TMGH, 5th Edition.
2.	"How to Java", Dietel & Dietel.

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Engineering) Part-III Sem-V**				
Course Title	**:**	**Seminar**		**Course Code**	**:**	CS318
Teaching Scheme (Hours)	**:**	Practical	02 Hours/Week	**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**	IOE=50	Grand Total =50	**Duration of IOE**	**:**	02 Hrs.
Revision	**:**	Fourth		**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Soft Skills				
Course Domain	**:**	Management				

Course Rationale: Students will able to find recent topics from published research papers and will try to give presentation of it. This will be helpful further for Mini Project and Major Project.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Help to develop effective communication skills	1.	Develop learning tools that will help to be life-long learners.
2.	Help to develop effective presentation skills.	2.	Investigate current scientific issues facing society.
3.	Introduce how to compete successfully in the business environment	3.	Acquire practice skills those are necessary for any academic learner
4.	Create ability to perform close and critical readings.	4.	Get acquainted with the organization structure, business operations and administrative functions.
5.	Identify, understand and discuss current, real-world issues	5.	Create and convey verbal and non-verbal method of communication that demonstrates respect and understanding in a complex society.

Practical Covered

Every individual student has to select a technical and field relevant topic for seminar and he or she has to deliver the same in the class. Seminar should consist of a presentation of about 30-40 minutes by every individual student. The main objectives of seminar are to provide exposure to latest developments and trends in Computer Science and Technology and to prepare a detailed seminar report for submission and

evaluation. A report on the seminar should be submitted to the department. Assessment should be jointly done by panel of teachers consisting of respective guide and other teachers from the department

Class, Part & Semester	:	**Third Year B. Tech (Computer Science and Engineering) Part-III Sem-V**									
Course Title	:	**Research Methodology**						***Course Code***	:	RM311	
Teaching Scheme (Hours)	:	Lectures			2 hr. /week			***Total Credits***	:	Nil	
Evaluation Scheme (Marks)	:	Assignment Viva-voce	: :	50 25	Written Test Grand Total	: :	25 100	***Duration of SEE***	:	Not Applicable	
Revision	:	Fourth						***Month***	:	June 2022	
Pre-requisites *(If any)*	:	No									
Course Domain	:	Research Skills									

Course Rationale: Having studied this course, the researchers can formulate the path to be used in conducting any research and reporting its findings. The course helps in the search of literature, development of research questions and the creation of the most suitable study design. In a way research methodology is the constitution for research.

Course Assessment Methods: The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives: The Course Teacher will		***Course Outcomes:*** Students will be able to	
1.	Introduce research phenomenon and its key components to the students.	1.	Understand some basic concepts of research and its methodologies.
2.	Discuss the role and importance of research in the engineering sciences.	2.	Explain key research concepts and issues.
3.	Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.	3.	Read, comprehend, and explain research articles in their academic discipline.
4.	Help identify various sources of information for literature review and data collection.	4.	Select and define appropriate research problem and parameters.
5.	Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting.	5.	Follow research procedures of sampling, data collection, analysis and finally reporting of research work.

Curriculum Content	**Hours**
Unit I: Introduction to Research: Definition and basic Types of research, Research process and steps in it, Concept of Hypothesis, Research proposals and aspects.	03
Unit II: Basic Statistics required for any research: Introduction to Descriptive Statistics, Statistical data, Variable, Classification of data, exploratory data analysis, Measures of central tendency, Dispersion-Standard deviation, Correlation and regression analysis.	06
Unit III: Introduction to Design of Experiment: Concept of design of experiment, its objectives, strategies, Factorial experimental design, designing engineering experiments, basic principles, of replication. Guidelines of experiments.	06
Unit IV: Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, goodness of fit tests, Chi-Square test, Kolmogorov-Smirnov(K-S) test.	06

Unit V: Two factor Factorial Design: Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.	07

Suggested Reference Books:

1.	Kothari, C.R., Research Methodology –Methods and techniques, New Age Publications, New Delhi, 2009.
2.	Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, Wiley India.
3.	Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers, Wiley India.
4.	J. Medhi, Statistics Methods, New Age Publications, New Delhi 2009.
5.	Nabendu Pal and Saheb Sarkar, Statistics: Concepts and Applications, Prentice Hall of India Pvt. Ltd. New Delhi, 2004.
6.	Panneerselvam, R., Research Methodology, Prentice-Hall of India, New Delhi, 2004

Class, Part& Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	**Compiler Construction**			**Course Code**	**:**	CS321
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	04
		Tutorial	01 Hours/Week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	The knowledge of System Programming					
Course Domain	**:**	Core (Compiler)					

Course Rationale: The key of compiler construction is essential how programming languages and computer work together. Compiler techniques are needed to properly design and implement these languages.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Initiate an understanding of compilers in general and brief about phases of compiler.	1.	Describe different phases of compiler.
2.	Conceptualize how compiler makes tokens in Lexical analysis	2.	Implement generation of token in Lexical analysis.
3.	Explore how grammar will be used in finding syntax error	3.	Identify checking of code for syntax errors using grammar.
4.	Describe how compiler builds syntax tree and allocates the memory	4.	Understand steps for generating syntax tree and memory allocation.
5.	Explain Optimization of the machine code generated by the compiler to make it faster and more efficient	5.	Implement generation of intermediate code and applying optimization principles on for code optimization.
6.	Help to understand how machine language code will be generated from intermediate code	6.	Apply optimization principles on given code which is generated by the compiler to make it faster and more efficient.

Curriculum Content	**Hours**
Unit I: Introduction Compilers, Phases of a compiler, Compiler construction tools, A simple one pass compiler.	4
Unit II: Lexical Analysis Role of a Lexical analyser, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyser generator	7
Unit III: Syntax Analysis Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.	9
Unit IV: Syntax Directed Translation and Run Time Environments Syntax directed definitions, construction of syntax tree, Source language issues, storage organization and allocation strategies, parameter passing, symbol table organizations and generations, dynamic storage allocations.	7
Unit V: Intermediate Code Generation	5

Intermediate languages, declarations, assignment statements and Boolean expressions, case statements, back patching, procedure calls.	
Unit VI: Code Generation Issues in design of a code generator and target machine, Run time storage management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, assignment and basic blocks, code generation from Dags and the dynamic code generation algorithm.	7

Suggested Text Books:	
1.	"Compilers - Principles, Techniques and Tools", A.V. Aho, R. Shethi and J.D.Ullman, Pearson Education
Suggested Reference Books:	
1.	"Compiler Construction", Dhamdere, Mc-Millan
2.	"Compilers - Principles, Techniques and Tools", A.V. Aho, R. Shethi and J.D.Ullman, Addison Wesley Publishing Company.
3.	"Compiler Construction", Barret, Bates, Couch, Galgotia.
4.	"Unix Programming", Pepkin Pike

Class, Part & Semester	**:**	**T. Y. B.Tech (Computer Science and Technology) Part-III, Sem-VI**					
Course Title	**:**	**Advanced Operating System**			**Course Code**	**:**	**CS322**
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	04
		Tutorial	01 Hours/Week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic concepts of Operating System and programming concepts					
Course Domain	**:**	Core (Unix Operating System)					

Course Rationale: Advanced operating system including multi-user concepts. The purpose of this course is to develop the knowledge of an advanced UNIX operating systems. This course provides the basic understanding of the UNIX system architecture, concepts of buffer management, system calls and internal representation of file-system, process control and memory management concepts.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Describe the concepts, design, and structure of the UNIX operating system.	1.	Analyze architecture of UNIX and windows operating system.
2.	Describe the concept of working of buffer cache and internal representation of files	2.	Conceptualize the knowledge of basic issues with fundamental of buffer cache and internal representation of files.
3	Describe system calls process for communication and internal representation of file system in UNIX OS.	3.	Study process and Structure of Process this covers a broad range of engineering aspects.

4.	Explain the concepts of structure of processes and process control in UNIX OS.	4.	Understand various concepts of Process and Process Control.
5.	Describe the knowledge of process control	5.	Understand concepts of process control
6.	Explain the concept of memory management policies.	6.	Analyze basic issues in representation, scheduling, allocation and management in operating system.

Curriculum Content	Hours
Unit: I Introduction General Overview of the UNIX System - History, System Structure, User Perspective, Operating System Services, Assumption about Hardware, Introduction to system concepts, Kernel Data Structure, System Administration.	05
Unit: II The Buffer Cache Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, advantages and disadvantages of cache.	05
Unit: III Internal Representation of Files Inodes, structure of the regular file, directories, conversion of a pathname to inode, super block, inode assignment to a new file, allocation of disk blocks, other file types. System calls for the file System **:** Open, Read, write, File and Record Locking, Adjusting the position of FILE I/O-LSEEK, Close, File Creation,Creation of Special File, Change Directory and Change Root, Change Owner and Change Mode, Stat and Fstat, Pipes, Dup, Mounting and Unmounting file systems, Link, Unlink, File System Abstractions, File System maintenance.	10
Unit: IV The Structure of Process Process stages and transitions, layout of system memory, the context of a process, Saving context of a process, manipulation of the process address space.	05
Unit: V Process Control Process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, the shell, System Boot and the Init process, Process Scheduling and Time : Process Scheduling, system call for time, clock.	09
Unit: VI Memory Management Policies Swapping, Demand passing, hybrid system with demand paging and swapping.	05

Suggested Text Books:

1.	"The Design of Unix Operating System", Maurice J. Bach, PHI.

Suggested Reference Books:

1.	"Unix Concepts and Administration", Sumitabha Das, TMGH, 3rd Edition.
2.	"Unix Shell Programming", Yeshvant Kanetkar, BPB Publications.
3.	"Unix Utilities", Tare, MGM.
4.	"Advanced Programming in the UNIX Environment", Stevens and Rego, Pearson Education, 2nd Edition..

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	**Object Oriented Modelling and Design**			**Course Code**	**:**	**CS323**
Teaching Scheme (Hours)	**:**	Lecture	04Hours/Week		**Total Credits**	**:**	04
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic knowledge of software engineering is required.					
Course Domain	**:**	Core					

Course Rationale: The object-oriented modelling approach creates the union of the application and database development and transforms it into a unified data model and language environment. Object-oriented modelling allows for object identification and communication while supporting data abstraction, inheritance and encapsulation through modelling

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Help to create, Critique and Refine customer Use Cases.	1.	Know the concept of object-oriented development.
2.	Explain Use Cases into Object Oriented software Realizations through OO Analysis and OO Design.	2.	Use the approaches to system design and object design.
3.	Describe how to Document your requirements, analysis, and design models in (UML) notation.	3.	Implement the object-oriented modelling and design patterns.
4.	Demonstrate techniques of state machines and design patterns to your designs.	4.	Describe how design patterns facilitate development.
5.	Help to prepare Interaction of the real world system.	5.	Measure the Level of User satisfaction and software quality assurance.
6.	Enable students develop Component and deployment view of the problem statement.	6.	Design all structural and behavioural views of the software system.

Curriculum Content	**Hours**
Unit: I Introduction: Object Oriented development and themes, evidence for usefulness, modeling as a Design Technique. Objects, classes, links and associations, generalization and inheritance, grouping constructs, aggregation, abstract classes, generalization as extension and restriction, multiple inheritance, metadata, candidate keys and inheritance.	09
Unit: II Dynamic and Functional Modeling Events, states, operations, concurrency, nested state diagrams, advanced dynamic modeling concepts, relation of object and dynamic models, DFD, relation of functional to object and dynamic models.	08

Unit: III Design Methodology Impact of an object oriented approach, Analysis, System design with examples, combining models, Designing models, designing Algorithms, Optimization of design, control. Associations, Physical packaging, Comparing methodologies using structure analysis and design, Jackson's structured Development Information modeling notation and object oriented works.	09
Unit: IV Structural Modeling using UML Classes, Relationships, Common mechanisms. Diagrams, Class Diagrams, Interfaces, Types and Roles, Packages, Instances and Object Diagram.	09
Unit: V Behavioral Modeling using UML Interactions, Use cases, Use case diagram, Interaction Diagrams and Activity diagrams, Events and signals, State Machines, Processes and Threads, Time and space, State chart diagrams.	09
Unit: VI Architectural Modeling using UML Components, Deployment, Collaboration, Patterns and Frame works, Component Diagrams and Deployment Diagrams.	08

Suggested Text Books:	
1.	"Object Oriented Modeling and Design", Rambaugh, Premerlani, Eddy, Lorenson, PHI.
2.	"The Unified Modeling Language User Guide", Grady Booch, Jeams Rambaugh, Ivar Jacotson, Addison Wesley.
Suggested Reference Books:	
1.	"Object Oriented Analysis and Design", Andrew High, TMG.
2.	"Practical Object Oriented Design with UML", Mark Priestley.
3.	"Object Oriented Analysis and Design", Kahate, TMH.

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	Computer Graphics and Multimedia Techniques			**Course Code**	**:**	CS324
Teaching Scheme (Hours)	**:**	Lecture	04Hours/Week		**Total Credits**	**:**	04
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic knowledge of Computer Systems, Matrix Algebra, Calculus in Three Dimensions, or equivalents					
Course Domain	**:**	Core					

Course Rationale: Computer Graphics and Multimedia Techniques introduces various graphics devices. This course aims to elaborate 2D and 3D transformations, Line and circle drawing algorithm, scan conversion techniques etc. Course focuses on various viewing and clipping algorithm. It describes curve, surfaces and multimedia applications.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Introduce the use of the components of a graphics system.	1.	List the basic concepts used in computer graphics.
2.	Describe the basic principles of three-dimensional computer graphics.	2.	Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3.	Provide an understanding of how to scan convert the basic geometrical primitives.	3.	Describe the importance of viewing and projections.
4.	Provide an understanding of mapping from a world coordinate to device coordinates.	4.	Define the fundamentals of animation, virtual reality and its related technologies.
5.	Enable to discuss the application of computer graphics concepts in games	5.	Understand a typical graphics pipeline.
6.	Analyse the fundamentals of animation, underlying technologies, principles, and applications	6.	Understand the principles of multimedia techniques.

Curriculum Content	**Hours**
Unit I Introduction to Graphics Devices: Display Devices and Adapters, Working of Printers, LCD Display	03
Unit II Transformations: Basic 2D & 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections	08
Unit III Raster Scan Graphics: Bresenham's line and circle drawing algorithms, Scan Conversion techniques: RLE, Frame Buffer, Scan converting polygons: Edge fill and Seed fill algorithms, Antialiasing and Half-toning.	07
Unit IV Viewing and Clipping: Introduction, Windowing and View-porting, Introduction to clipping, Point clipping, Line clipping: Sutherland - Cohen line clipping algorithm.	06
Unit V Curves and Surfaces: Curve Representation, Non-parametric and parametric curves, representation of space curves, Cubic Spline, Parabolic Blended curves, Bezier curves and B-spline curves, Z- buffer, Warnock algorithm.	08
Unit VI Multimedia Applications: Media preparation, composition, integration, communication, entertainment using commercial tools	07

Suggested Text Books:

1. "Multimedia Communication", Fred Halsall, Pearson Education
2. "Mathematical elements for Computer Graphics" - David F. Rogers, J. Alan Adams (MGH Int.) (For chapters 1, 2, 6.

3.	"Procedural elements for Computer Graphics" - David F. Rogers, (MGH Int.) (For chapters 3, 4)
4.	"Multimedia Making it Work", Tay Vaughan, TMGH, 5th Edition.
Suggested Reference Books:	
1.	Newman Sproul, "Principles of Interactive Computer Graphics" - (MGH) (chapters 1,4)
2.	Prof. Rajesh Maurya, "Computer Graphics" (Wiley India Pvt. Ltd.) (Chapter 4)
3.	Hearn & Baker, "Computer Graphics".
4	Ranjan Parekh, "Principles of Multimedia", TMGH Maurya

Class, Part& Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	**Engineering Economics**			**Course Code**	**:**	CS325
Teaching Scheme (Hours)	**:**	Lecture	03Hours/Week		**Total Credits**	**:**	03
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic knowledge of economics and Mathematics.					
Course Domain	**:**	Management					

Course Rationale: Engineering Economics and Management highlights the importance of economics and management in engineering and helps engineers in managerial decision. Engineering economics make fundamentally strong base for decision making skills by applying the concepts of economics. This course will educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer. This course content also Prepare engineering students to analyse profit/revenue data and carry out make economic analysis in the decision making process to justify or reject alternatives/projects.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Discuss principles and economics analysis of decision making	1.	Develop a thorough understanding on engineering decision making
2.	Discuss cost concepts, make-versus-purchase studies	2.	Understand the principles of economics analysis of design process
3.	Elaborate principles of money – time relationships	3.	Understand the different costs (fixed cost, variable cost, direct cost, indirect cost standard cost and opportunity cost)
4.	Explain to work on cash flow analysis	4.	Realize the money time relationships
5.	Explain supply and demand relations	5.	Understand price changes and inflation
6.	Discuss breakeven point analysis and effects of inflation on money time relationships	6.	Understand price and relations using graphical Approach.

Curriculum Content	Hours
Unit I : Introduction to Economics Economics in Decision Making, Business Economics and Engineering, Supply and Demand Introduction, Demand analysis, Elasticity of Demand, Demand forecasting, Supply analysis, Elasticity of supply, Supply and Demand interaction.	7
Unit: II Consumer Behaviour Demand and consumer behaviour, Utility approach: Marshall's law: Diminishing utility and equi-marginal utility, Indifference curves, Revealed Preference approach.	4
Unit: III Production Function Cobb-Douglas production function, Economies of scale, Competition and types of Markets, Perfect and Imperfect competition, Monopoly, Monopolistic and oligopoly competition, Mergers & Acquisitions.	8
Unit: IV Money and National Income a) Concepts of National Income: GNP, GDP, GNI, Green GNP, GreenGDP, NNP, NNI, PCI. b) Money: Demand and Supply, Monetary and fiscal policies in India, Public finance. c) Welfare Economics: Benham, Pareto, Kaldor and Amartya Sen contribution. d) Resource Economics: Renewable and renewable resources, variation method.	7
Unit: V Inflation Price index, Inflation: Meaning, types, causes, measurements and effects, inflation and determination of interest rates, Measures to control (REPO rate C.R.R.) Foreign Exchange Rates: Fixed vs floating, P-P-P theory and current practices to decide exchange rates.	7
Unit: VI International Trade Modern Theory: Heckscher- Ohlin's comparative cost doctrine, Leontief paradox, Terms of trade and non-trade, trade barriers and WTO, Cost benefit analysis of FDI.	6

Suggested Text Books:	
1.	"Managerial Economics", D.N. Dwivedi, Vikas Publishing.
2.	"Macro Economics", D.N. Dwivedi, Tata McGraw Hill, New Delhi
3.	"Micro Economics", D.M. Mithani.
4.	"Macro Economics", D.M. Mithani.
Suggested Reference Books:	
1.	"Modern Micro Economics", Koutsoyiannis.
2.	"Fundamentals of Engineering Economics", Park, Prentice Hall.
3.	"Economics", Samuelson.
4.	"Growth Economics", Sen A.K, Penguin Books, England

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology), Part-III Sem-VI**					
Course Title	**:**	**Object Oriented Modelling and design Lab**			**Course Code**	**:**	**CS323L**
Teaching Scheme (Hours)	**:**	Practical	2Hours/Week		**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**		EOE =50	Grand Total =50	**Duration of EOE**	**:**	03Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Theoretical Knowledge of software engineering.					
Course Domain	**:**	Core					

Course Rationale: Object-oriented modelling (OOM) is a common approach to modelling applications, systems, and business domains by using the object-oriented paradigm throughout the entire cycles. Object-oriented modelling enables this by producing abstract and accessible descriptions of both system requirements and designs, i.e. models that define their essential structures and behaviours like processes and objects, which are important and valuable development assets with higher abstraction levels above concrete and complex source code.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Explain model using UML class notations and use-cases	1.	Master the concepts of Object-oriented modelling, designing and should have attained practical skills in applying these concepts
2.	Describe the OO design of a system from the requirements model	2.	Understand UML in detail, its diagrams as modelling tool for large and complex software systems.
3.	Help to implement the OO designs modeled using UML.	3.	Draw an Object Oriented model and implement it using UML tool.
4.	Explain the nature of design patterns by understanding a small number of examples.	4.	Have better understanding of requirements cleaner designs and more maintainable systems.
5.	Demonstrate OO design heuristics, patterns or published guidance	5.	Create use case, interaction & Deployment diagrams for documents that capture requirements.

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration

Sr. No.	**List of Experiments**
1.	Introduction to OOMD.
2.	Introduction of Star UML – a. Purpose , Installation, b. Uses c. Different types of UML Diagrams (Classification of UML Diagrams).

3.	Study of Use case Diagram – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
4.	Study of Class Diagram – a. Introduction, Purpose, Relation(Generalization, Aggregation, composition) b. Notations(components), c. Any systems Examples(at least 3)
5.	Study of Interaction Diagram[Sequence Diagram] – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
6;	Study of Interaction Diagram[Collaboration Diagram] – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
7.	Study of Activity Diagram – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
8.	Study of State Diagram – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
9.	Study of Component Diagram – a. Introduction, Purpose, b. Notations(components), c. Any systems Examples(at least 3)
10.	Study of Deployment Diagram – a. Introduction, Purpose, b. Notations(components) c. Any systems Examples(at least 3)

Class, Part & Semester	**:**	**Third Year B. Tech (Computer Science and Technology), Part-III Sem-VI**					
Course Title	**:**	**Computer Graphics and Multimedia Techniques Lab**			**Course Code**	**:**	CS324L
Teaching Scheme (Hours)	**:**	Practical	2Hours/Week		**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**	IPE = 50	EPE =50	Grand Total = 100	**Duration of EPE**	**:**	03Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Basic Geometry, Trigonometry, Vectors and Matrices, Data Structures and Algorithms					
Course Domain	**:**	Core					

Course Rationale:
The goal of the study in Computer Graphics and Multimedia is learn theory, technology, procedures, and skills in computer graphics and multimedia. In-depth knowledge of image synthesis in computer graphics, speech processing and recognition, sound and video sequences algorithms for multimedia, and development of systems for human-computer interaction.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Introduce and understand the structure of modern computer graphics	1.	Explain the mathematical and theoretical principles of computer graphics.
2.	Demonstrate the basic principles of three-dimensional computer graphics.	2.	Use matrix algebra in computer graphics, implement fundamental algorithm, transformations involved in viewing models.
3.	Help to implement scan conversion of the basic geometrical primitives and to transform	3.	Write basic graphics programs for projection models.
4.	Describe the mapping from a world coordinate to device coordinates, clipping, and projections.	4.	Analyse and evaluate the use of computer graphics methods and describe effects such as antialiasing.
5.	Demonstrate, design and problem-solving skills with application to computer graphics.	5.	Apply computer graphics techniques to creating aesthetic effect.
6.	Demonstrate the fundamentals of animation, underlying technologies, principles, and applications.	6.	Analyse the animation of any object using animation principles.

General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration

Sr. No.	**List of Experiments**
1.	Study of Computer graphics devices adapters and multimedia storage devices
2.	Two Dimensional transformations
3.	Three Dimensional transformations and animations
4.	Generalized Bresenham's line drawing algorithm
5.	Bresenham's circle drawing algorithm
6.	Polygon filling algorithm
7.	Clipping algorithms like two dimensional clipping, Sutherland Cohen Clipping
8.	Windowing, Hidden line and surfaces
9.	Compression technique algorithms for text, image and video
10.	Bezier curve
11.	Study of mm file formats and conversions (BMP-JPG,WAV-MP3,DAT-MPEG)
12.	GIF animator / Flash /3D Max/Maya etc.
13.	Application software/animation using multimedia concepts

Class, Part& Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	**Advanced Programming Lab**			**Course Code**	**:**	CS326L
Teaching Scheme (Hours)	**:**	Lecture	02Hours/Week		**Total Credits**	**:**	03
		Practical	02 Hours/Week				
Evaluation Scheme (Marks)	**:**	IPE=50	EPE=50	Grand Total =100	**Duration of SEE**	**:**	03 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	The knowledge of Computer Architecture, Programming knowledge					
Course Domain	**:**	Core (Application Programming)					

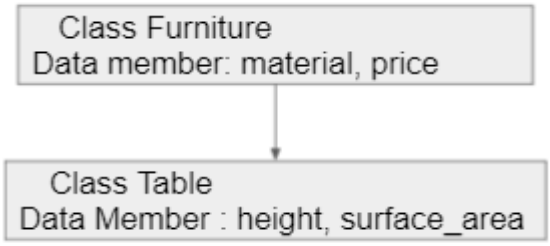
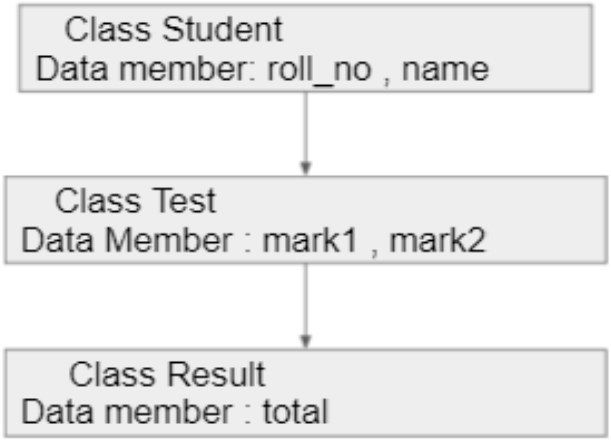
Course Rationale: Advanced programming is one of most versatile and modern programming language. It provides with libraries that make writing code quicker and easier. Lab implements OOP concepts with C#. It focuses on developing windows application, web application with the use of ADO.Net.

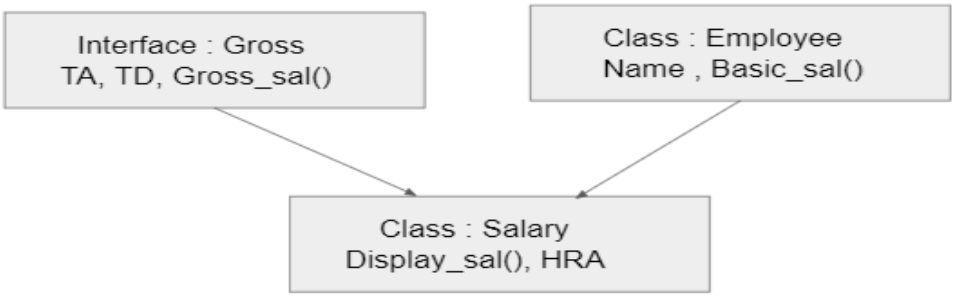
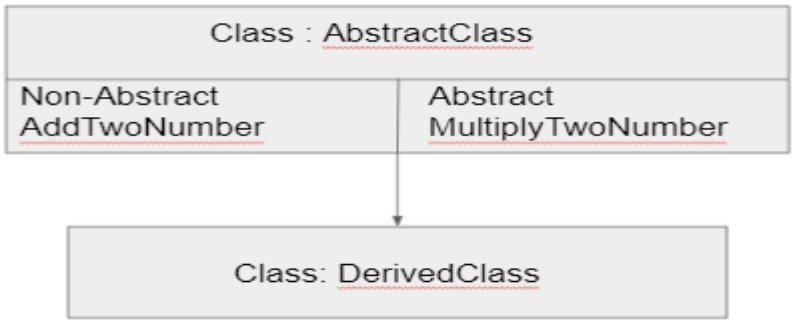
Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Enable student to make understand .net Architecture	1.	Study .net Architecture.
2.	Describe OOPS Concepts with C#	2.	Write program using OOPS concepts in C#
3.	Discuss Inheritance, Exception Handling in C#	3.	Describe exception handling in C#
4.	Explain windows controls and to program them.	4.	Implement inheritance in C#
5.	Describe user friendly application	5.	Develop windows applications.
6.	Describe how to handle database in C#	6.	Handle data using ADO.net in C#.

Curriculum Content	**Hours**
Unit I: .NET Architecture The Relationship of C# to .NET, The Common Language Runtime, A Closer Look at Intermediate Language, Assemblies, .NET Framework Classes, Namespaces	2
Unit II: C# Basics Variables, Predefined Data Types, Flow Control, Enumerations, Arrays, Namespaces, The Main () Method, More on Compiling C# Files, Console I/O, Using Comments, The C# Pre-processor Directives, C# Programming Guidelines Classes and Structs, Class Members, Constructors, Constructor Overloading, Destructors.	3
Unit III: Inheritance, Exception Handling Types of Inheritance, Implementation Inheritance, Modifiers, Method Overloading, Method Overriding, Interfaces Exception classes, Introduction to Exceptions Exception handling, The Exception Class, C# Exception Handling Keywords, The Exception Chain, Nested Exception Handling, User-Defined Exception Classes	4
Unit IV : Using Controls for Application Development Control like: Textbox, Button, Radio button, Checkbox, List box, Combo box etc. Different Properties like: Name, Text, TabStop, TabIndex, Enabled, Selection Mode etc Events like: Keypress, Validating, Validated, Click, Checked Changed, SelectionIndexChanged etc.	7

Unit V: Other Controls like Menu and Containers Menu Strip, Status Strip, Tool Strip, Context Menu Strip, Group Box, Tab Control, Panel, Tab Control.	3
Unit VI: Using ADO.net ADO.NET object model, Connected and disconnected environment, Data sets and data adaptors, Command object and data readers, Data tables, rows and columns, data grid view control, Data View, Constraints and relations.	7

	General Instructions: Any 8 experiments to be performed from the list, any 2 experiments to be studied as demonstration
Sr. No.	**List of Experiments**
1.	1. Explain Architecture of .NET Framework 2. Explain CLR Execution model
2.	Write a console Application for conditional statements and loops: 1. Write a console Application that places double quotation marks around each word in a string. 2. Generate prime numbers. 3. Reverse a number and find the sum of digits of a number. 4. Test for vowels. 5. Generate Fibonacci series. 6. Generate diamond pattern with number.
3.	Note: Explain the array and information of class and structure. 1. Write a program in C# to find the second largest element in a single dimensional array 2. Write a program to declare a class "staff" having data members as name and post.accept this data 5 for 5 staffs and display names of staff who are HOD. 3. Write an application that receives the following information from a set of students: Student Id: Student Name: Course Name: Date of Birth: The application should also display the information of all the students once the data is Entered. Implement this using an Array of Structures. 4 .Write a program in C# to multiply two matrices using multidimensional arrays. 5. Find the sum of all the elements present in a jagged array of 3 inner arrays. 6. Write a program for finding the reverse of the string array by using array function argument.
4.	1. Write a Program to Declare class 'Distance' have data member dist1, dist2, dist3. Initialization two data members using constructor and store their addition in the third data member using function and display addition. (Parameterized Constructor) 2. Define a class 'Salary' which will contain member variables Basic, TA, DA, HRA.

	Write a program using Constructor with default values for DA and HRA and calculate the salary of the employee. (Parameter less Constructor). 3. Write a program using Copy Constructor to initialize a new instance to the values of an existing instance. (Define class 'Student' have data members Name, roll number, address, gender) 4. Write a program Constructor overloading. (Add the numbers)
5.	1. Write a program to implement single inheritance from the following figure. accept and display data for one table.  2. Write a program to implement multilevel inheritance from the following figure. accept and display data for one student.  3. Write a program for the above hierarchy for the Employee where the base class is Employee and derived class are Programmer and Manager. Here makes the display function visual common for all and which will display information of Programmer and Manager interactively. 
6.	(Method Overloading, Method Overriding, Method hiding) 1. Write a program using method overloading to swap two integer numbers and swap two float numbers.

	2. Write a program using method overloading to add the numbers by changing the number of parameters. 3. Write a program using method overloading to display the name and id of a student by changing the order of the parameters. 4. Method overriding 5. Method hiding
7.	Interface And Abstract Class 1. Program to implement the following multiple inheritance using interface.  2. Program to implement default implementation and Explicit Implementation using interface. 3. Program to calculate the area of square using abstract class and abstract method. 4. Program to implement the following non-abstract and abstract method using abstract class. 
8.	Enumeration 1. Write a program to create an enum. Here an enum with name **month** is created and its data members are the name of months like Jan, feb, mar, apr, may. Now let's try to print the default integer values of these enums. 2. Write a program to create an enum. Here an enum with name **gender** is created and its data members are the name of Male, Female, Unknown. Now let's try to print the Name and Gender.(using switch case
9.	Exception Handling 1 .Write a program to show how exceptions occurred in a program.

	2. Write a program to accept a number form the user and throw an exception if the number is not an even number. 3.Write a program to accept a two number form the user and divide the number and multiple try catch block exceptions .(Format Exception, Overflow Exception, DivideByZero Exception, Exception) 4. Write a program to user-defined Exception
10.	**Note: Information about type casting** 1. Study of boxing and Unboxing (also Write a code). 2. If you have two integers stored in variable var1 and var2, what Boolean test can you perform to see if not both numbers are greater than 10?
11.	Design & Develop windows application for simple Calculator
12.	Develop sample windows application for Student Information. (Label, textbox, button, radio Button, checkbox, combo Box, group Box). (Using Page navigation displays information on another page).
13.	1. Develop Windows application for registration page using validation (name email id, contact no, password, confirm password). (after login button click message box display yes no cancel) 2 Develop Sample window application for read and write the file.(menu strip use) open an exit button use menu strip, read write and search button in form
14.	Develop sample Windows application Form. (Collection information and display that information in grid view with table) name, mobile number ,courses, year
15.	ADO.NET Using generate windows form and web applications. 1. Develop sample Windows application form. use database connectivity Table include ID, name, email, contact number. buttons insert update delete. 2. Develop sample ASP.Net Web application. use database connectivity Table include ID, name, email, contact number. Display information in GridView.
Suggested Text Books:	
1.	Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, “Beginning C# 2008” – Wrox Publication
2.	Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, “Professional C# 2008” – Wrox Publication
Suggested Reference Books:	
1.	Chapman “Teach yourself Visual C++ in 21days” Techmedia publications
2.	Jon Bates & Tim Tompkins “Practical Visual C++” (PHI)

Class, & Semester	**:**	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**					
Course Title	**:**	**Mini Project**			**Course Code**	**:**	CS327
Teaching Scheme (Hours)	**:**	Practical	02Hours/Week		**Total Credits**	**:**	01
Evaluation Scheme (Marks)	**:**	IOE=50	EPE=00	Grand Total =50	**Duration of IOE**	**:**	02 Hrs.
Revision	**:**	Fourth			**Month**	**:**	June 2022
Pre-requisites (If any)	**:**	Seminar					
Course Domain	**:**	Humanity, Management					

Course Rationale: Students will try to work in a group and implement a small modules. With this students are prepare to follow the steps of Software Development Life Cycle during execution of project with smaller scale.

Course Objectives: The Course Teacher will		**Course Outcomes:** Students will be able to	
1.	Create awareness among the students to express technical ideas, strategies and methodologies in written form.	1.	Acquire practical knowledge within the chosen area of technology for project development
2.	Enable students to work as a responsible member and possibly a leader of a team in developing software solutions.	2.	Identify, analyze and handle programming projects with a comprehensive and systematic approach
3.	Motivate students to self-learn new tools, algorithms, and/or techniques that contribute to the software solution of the project	3.	Contribute as an individual or in a team in development of technical projects
4.	Create awareness among the students of the characteristics of several domain areas where IT can be effectively used.	4.	Develop effective communication skills for presentation of project related activities
5.	Improve the team building, communication and management skills of the students	5.	Formulate and propose a plan for creating a solution for the problem identified
6.	Enable students to develop a design solution for a set of requirements	6.	Report and present the findings of the study conducted in the preferred domain

Practical covered:

The mini-project should be undertaken preferably by a group of 3 students who will jointly work and implement the mini-project. The group will select a project with the approval of the guide. A batch of practical / Tutorial will be divided into mini project groups. Mini project topics and the work for these groups in the batch will be guided by a teacher for the batch, preferably on one of the topics like Compiler Construction, Database Engineering, Operating System, Computer Graphics and Multimedia, Advanced Programming and latest developments and trends in Computer Science and Technology. The teacher will periodically assess the performance of individual student in the mini project, jointly with a teacher of another batch. Project group will submit hardcopy project report along with project demonstration software in CD and/or project hardware gadget at the term end. The IOE of mini project will be jointly conducted by appointed examiners. Note: Use of Open source tools should be preferred.

Class, Part & Semester	:	**Third Year B. Tech (Computer Science and Technology) Part-III Sem-VI**								
Course Title	:	**Introduction To Foreign Language**						***Course Code***	:	HS321
Teaching Scheme (Hours)	:	Lecture:			2 hr. /week			***Total Credits***	:	Nil
Evaluation Scheme (Marks)	:	Assignment Viva-voce	: :	50 25	Written Test Grand Total	: :	25 100	***Duration of SEE***	:	Not Applicable
Revision	:	Fourth						***Month***	:	June 2022
Pre-requisites *(If any)*	:	No								
Course Domain	:	Language								

Course Rationale: This course provides a competitive edge for engineering graduates in their career choices. They will be able to communicate in a second language. The course enhances listening, reading skills and memory. Our graduates may be able to participate more effectively and responsibly in a multi-cultural world if they know another foreign language in addition to the English.

Course Assessment Methods: The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives: The Course Teacher will		***Course Outcomes:*** Students will be able to	
1.	Help students to understand basics and deepen their knowledge in a chosen foreign language.	1.	Learn alphabets and acquire knowledge of basic grammar of the foreign language, common words and phrases therein.
2.	Guide them to communicate and translate in the chosen foreign languages.	2.	Learn to read the simple texts in foreign language.
3.	Help them describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.	3.	Speak a little using the greetings, well wishes etc. in Foreign Language.
4.	Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations (spontaneous or recorded) that pertain to the topics mentioned above.	4.	Count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign Language.
5.	Explain how to write sentences and short paragraphs on familiar topics relating to personal interests and practical needs.	5.	Translate both verbally and written, simple sentences in the foreign language.
6.	Narrate on how the foreign language functions with awareness and understanding of the language culture.	6.	Achieve institute's mission with respect to global education and foreign language education.

Curriculum Content	**Hours**
Unit I: General Information on Basic Grammar of the foreign language, Introduction to alphabets.	05
Unit II: Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language.	05
Unit III: General Questions in foreign language, like What is your name/surname? Who/What is this? etc.	04
Unit IV: Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself.	05
Unit V: Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book.	05
Unit VI: Basic information on Country & Culture of language under study.	04

Suggested Reference Books:	
1.	V.N.Wagner and V. G. Ovsienko, "Russian Language", Russian, People's Publishing House, New Delhi.
2.	S. Khavronina and A. Shirochenskaya, "Russian in Exercises", 1991.
3.	"Genki – Japan Times".
4.	Osamu & Nobuko Mizutani, "Aural Comprehension in Japanese".
5.	Osamu & Nobuko Mizutani, "An Introduction to Modern Japanese".
6.	Y. Yoshida, "Japanese for Today".
7.	Ed Swick, "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time".
8.	Ed Swick, "Living German".
9.	Eugene Jackson and Adolph Geiger, "German Made Simple: Learn to Speak and Understand German Quickly and Easily".
10.	Professor Martin Durrell, "Hammer's German Grammar and Usage" (Fifth Edition).

Equivalence of Third Year B.Tech (Computer Science and Technology) Semester V and VI

The above detailed syllabus is a revised version of the Third Year B. Tech (**Computer Science and Technology**) Program being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2022, (Academic year 2022-23). The prime feature of this revision is the transformation of the existing curriculum into the Outcome based curriculum.

The Equivalence for the subjects/courses of **Computer Science and Technology** at Third Year B Tech Semester V and VI pre-revised Program under the faculty of Engineering and Technology is as follows.

Third Year B. Tech Semester V (Computer Science and Technology)

Sr. No.	Third Year B.Tech(Computer Science and Technology) Semester V Pre-revised syllabus	Third Year B.Tech(Computer Science and Technology) Semester V Revised syllabus	Remark
1.	System Programming	System Programming	No change in the subject content
2.	Computer Algorithms	Design and Analysis of Algorithm	Course Name Changed Slight modification in the content
3.	Operating System-I	Operating System	Course Name Changed No change in the subject content
4.	Software Engineering	Machine Learning	Software Engineering Shifted to Semester-IV Machine Learning new subject introduced
5.	Computer Graphics and Multimedia Techniques	Database Engineering	Computer Graphics and Multimedia Techniques shifted to Semester- VI
6.	System Programming Lab	Free Open Source Software Lab	Free Open Source Software Lab introduced in place of System Programming Lab
7.	Computer Graphics and Multimedia Techniques Lab	Database Engineering Lab	Computer Graphics and Multimedia Techniques Lab shifted to Semester- VI
8.	Java Programming Lab	Java Programming Lab	No change in the subject content
9.	Seminar	Seminar	No change in the subject content
10.	Internship- I	Internship- I	No change in the subject content
11.	Research Methodology	Research Methodology	No change in Audit Course

Third Year B. Tech Semester VI (Computer Science and Technology)

Sr. No.	Third Year B Tech(Computer Science and Technology) Semester VI Pre-revised syllabus	Third Year B.Tech.(Computer Science and Technology Semester VI Revised syllabus	Remark
1.	Compiler Construction	Compiler Construction	No change in the subject content
2.	Operating System- II	Advanced Operating System	Course Name Changed No change in the subject content
3.	Object Oriented Modeling and Design	Object Oriented Modeling and Design	No change in the subject content
4.	Database Engineering	Computer Graphics and Multimedia Techniques	Database Engineering shifted to Semester- V
5.	Engineering Economics	Engineering Economics	No change in the subject content
6.	Object Oriented Modeling and Design Lab	Object Oriented Modeling and Design Lab	No change in the subject content
7.	Database Engineering Lab	Computer Graphics and Multimedia Techniques Lab	Database Engineering Lab shifted to Semester- V
8.	Advanced Programming Lab	Advanced Programming Lab	No change in the subject content
9.	Mini Project	Mini Project	No change in the subject content
10.	Introduction to Foreign Language	Introduction to Foreign Language	No change in the subject content

For above Theory Courses 1 to 5 the Mid Semester Evaluation pattern is given below.			
	CIE = 50 (UT I = 20, UT II = 20, Course work* =10)	CIE = 30 (CIE= 20, Course work =10)	CIE marks distribution.

Audit course have not been assigned any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. (Obtaining passing grade is essential). Please refer to chart in the detail examination scheme. The chart shows the marks range and the respective grade.

*__Course work:__ It consists of assignments, quiz, seminars, presentations, research papers and research articles, developing working models, surveys and activities related to course as designed by the course coordinator to suit the needs of the course and to complement programme outcomes. The practical work and its journal is not part of course work.