

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW



Evaluation Scheme & Syllabus

For

B.Tech. 3rd Year

(Computer Science and Design)

(Effective from the Session: 2023-24)

B.TECH, 3rd Year

COMPUTER SCIENCE DESIGN

CURRICULUM STRUCTURE

SEMESTER- V

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KCS501	Database Management System	3	1	0	30	20	50		100		150	4
2	KCD501	Web Designing and Development	3	1	0	30	20	50		100		150	4
3	KCS503	Design and Analysis of Algorithm	3	1	0	30	20	50		100		150	4
4	Dept. Elective-I	Departmental Elective-I	3	0	0	30	20	50		100		150	3
5	Dept. Elective-II	Departmental Elective-II	3	0	0	30	20	50		100		150	3
6	KCS551	Database Management System Lab	0	0	2				25		25	50	1
7	KCD551	Web Designing and Development Lab	0	0	2				25		25	50	1
8	KCS553	Design and Analysis of Algorithm Lab	0	0	2				25		25	50	1
9	KCS554	Mini Project or Internship Assessment*	0	0	2				50			50	1
10	KNC501/ KNC502	Constitution of India. Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
11		MOOCs (Essential for Hons. Degree)											
		Total	17	3	8							950	22

*The Mini Project or internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

SEMESTER- VI

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KCD601	Augmented & Virtual Reality	3	1	0	30	20	50		100		150	4
2	KCS602	Web Technology	3	1	0	30	20	50		100		150	4
3	KCS603	Computer Networks	3	1	0	30	20	50		100		150	4
4	Deptt. Elective-III	Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I [Annexure - B(iv)]	3	0	0	30	20	50		100		150	3
6	KCD651	Augmented & Virtual Reality Lab	0	0	2				25		25	50	1
7	KCS652	Web Technology Lab	0	0	2				25		25	50	1
8	KCS653	Computer Networks Lab	0	0	2				25		25	50	1
9	KNC601/ KNC602	Constitution of India. Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
10		MOOCs (Essential for Hons. Degree)											
		Total	0	3	6							900	21

Departmental Elective-I

1. KCS051 Data Analytics
2. KCD051 Metaverse
3. KCS053 Computer Graphics
4. KCS054 Object Oriented System Design

Departmental Elective-II

1. KCS055 Machine Learning Techniques
2. KCD053 Multimedia and Animation
3. KCD054 Software Engineering
4. KCS058 Human Computer Interface

Departmental Elective-III

1. KCS061 Big Data
2. KCS062 Image Processing
3. KCD061 Digital Marketing
4. KCD062 Game Design

B.TECH. (CSD)

FIFTH SEMESTER (DETAILED SYLLABUS)

KCS501			Database Management System		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able to:					
CO 1	Apply knowledge of database for real life applications.				K ₃
CO 2	Apply query processing techniques to automate the real time problems of databases.				K ₃ , K ₄
CO 3	Identify and solve the redundancy problem in database tables using normalization.				K ₂ , K ₃
CO 4	Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.				K ₂ , K ₄
CO 5	Design, develop and implement a small database project using database tools.				K ₃ , K ₆
DETAILED SYLLABUS					3-1-0
Unit	Topic				Proposed Lecture
I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.				08
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL				08
III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design				08
IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.				08
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.				08
Text books:					
<ol style="list-style-type: none"> 1. Korth, Silbertz, Sudarshan, " Database Concepts", McGraw Hill 2. Date C J, "An Introduction to Database Systems", Addison Wesley 3. Elmasri, Navathe, " Fundamentals of Database Systems", Addison Wesley 4. O'Neil, Databases, Elsevier Pub. 5. RAMAKRISHNAN "Database Management Systems", McGraw Hill 6. Leon & Leon, "Database Management Systems", Vikas Publishing House 7. Bipin C. Desai, " An Introduction to Database Systems", Gargotia Publications 8. Majumdar & Bhattacharya, "Database Management System", TMH 					

KCD501		Web Designing and Development	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to:			
CO 1	Understand principle of Web page design and about types of websites	K ₃ , K ₄	
CO 2	Visualize and Recognize the basic concept of HTML and application in web designing.	K ₁ , K ₂	
CO 3	Recognize and apply the elements of Creating Style Sheet (CSS).	K ₂ , K ₄	
CO 4	Understanding the basic concept of Java Script and its application.	K ₂ , K ₃	
CO 5	Introduce basics concept of Web Hosting and apply the concept of SEO	K ₂ , K ₃	
DETAILED SYLLABUS			3-0-0
Unit	Topic	Proposed Lecture	
I	Introduction to HTML : Brief Introduction of HTML, HTML Tags, Basic structure of an HTML document, Heading-Paragraphs, Line Breaks Elements of HTML: Introduction to elements of HTML, Working with Text, Formatting Tags, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls, Marquee Elements	08	
II	Introduction to Cascading Style Sheets: Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin , properties) Navigation Bar, CSS Color, Creating page Layout and Site Designs.	08	
III	BOOTSTRAP: Fundamentals of implementing responsive web design. Use Balsamiq to mockup and wireframe websites, The fundamentals of UI design for websites ,How to install the Bootstrap framework ,Understanding the Bootstrap grid layout system ,How to use bootstrap containers to layout your website easily ,Use other Bootstrap components such as buttons ,Adding symbols using Font Awesome ,Bootstrap carousels. Add Bootstrap cards to your website. Using Bootstrap navigation bars	08	
IV	JAVA SCRIPT : The Fundamentals of Code ,Starting code with alerts and prompts, Understand Variables and Data Types in JavaScript Variable naming in JS ,Working with strings and numbers Randomisation and logical operators Loops, collections and Conditionals ,Functions and invocation patterns Discussion of ECMAScripts Intermediate JavaScript, JS Expressions, Operators, Statements and Declarations ,Object-Oriented Programming JS Objects and Prototypes ,`This`, Scope and Closures Objects and Prototypes Refactoring and Debugging ,Assignment 3: BMI Calculator	08	
V	REACT JS: Learn front-end development with React ,Understand when and how to use React Components ,Props and work with them ,JSX and understand JSX syntax ,React DOM,State Management in React ,React Hooks, Conditional rendering in React, Understand the difference between class and functional components, Event Handling in React.	08	
Text books:			
1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India			

KCS503		Design and Analysis of Algorithm	
Course Outcome (CO)		Bloom’s Knowledge Level (KL)	
At the end of course , the student will be able to:			
CO 1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.	K ₄ , K ₆	
CO 2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).	K ₅ , K ₆	
CO 3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.	K ₂ , K ₅	
CO 4	Apply classical sorting, searching, optimization and graph algorithms.	K ₂ , K ₄	
CO 5	Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.	K ₂ , K ₃	
DETAILED SYLLABUS			3-1-0
Unit	Topic	Proposed Lecture	
I	Introduction: Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	08	
II	Advanced Data Structures: Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	08	
III	Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. Greedy Methods with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim’s and Kruskal’s Algorithms, Single Source Shortest Paths - Dijkstra’s and Bellman Ford Algorithms.	08	
IV	Dynamic Programming with Examples Such as Knapsack. All Pair Shortest Paths – Warshal’s and Floyd’s Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	08	
V	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms	08	
Text books:			
<ol style="list-style-type: none"> 1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India. 2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", 3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008. 4. LEE "Design & Analysis of Algorithms (POD)", McGraw Hill 5. Richard E. Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning 6. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005. 7. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006. 8. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997 9. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011. 10. Harsh Bhasin, "Algorithm Design and Analysis", First Edition, Oxford University Press. 			

KCS051		Data Analytics
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to :		
CO 1	Describe the life cycle phases of Data Analytics through discovery, planning and building.	K1,K2
CO 2	Understand and apply Data Analysis Techniques.	K2, K3
CO 3	Implement various Data streams.	K3
CO 4	Understand item sets, Clustering, frame works & Visualizations.	K2
CO 5	Apply R tool for developing and evaluating real time applications.	K3,K5,K6
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction to Data Analytics: Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.	08
II	Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	08
III	Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions.	08
IV	Frequent Itemsets and Clustering: Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	08
V	Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	08
Text books and References:		
1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer		
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.		

3. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
5. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics", EMC Education Series, John Wiley
6. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series
7. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier
8. Anil Maheshwari, "Data Analytics", McGraw Hill Education
9. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill
10. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer
11. Mark Gardner, "Beginning R: The Statistical Programming Language", Wrox Publication
12. Pete Warden, Big Data Glossary, O'Reilly
13. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
14. Pete Warden, Big Data Glossary, O'Reilly.
15. Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press
16. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier

KCD051		Metaverse	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to:			
CO 1	Students will understand the History of Metaverse.	K ₁	
CO 2	Learn the role of Metaverse to connect the real world and blockchain.	K ₁ , K ₂	
CO 3	Working with advanced development of blockchain in the future.	K ₁ , K ₂	
CO 4	Exploring the open ecosystem of smart properties and assets.	K ₂	
CO 5	Integrating futuristic technologies such as blockchain, cryptocurrency, DAO, AR/VR	K ₂	
DETAILED SYLLABUS			3-0-0
Unit	Topic	Proposed Lecture	
I	INTRODUCTION TO METAVERSE: Introduction to Metaverse and immersive experience-History of Metaverse- Metaverse value chain with 7 layer	08	
II	TECHNOLOGIES INVOLVED IN THE METAVERSE : Metaverse as a product of Extended Reality- Augmented Reality (AR)- Virtual Reality (VR)-Benefits of AR/VR-Difference between AR/ VR - Mixed Reality (MR)-Artificial Intelligence (AI) ,Introduction in Metaverse-Financial and Economics of Metaverse-Benefits of Metaverse	08	
III	BLOCKCHAIN ADOPTION IN METAVERSE: Blockchain Overview-History of Blockchain-Need of Decentralization in MV-Smart Contract , Capabilities in Blockchain - Blockchain in Metaverse -Understanding Tokens-Understanding the NFT-NFT Token Standards-NFTs in MV-Cryptocurrency in MV	08	
IV	AR, VR, AND MR IN METAVERSE : Everything about VR (Virtual Reality)-Everything about AR (Augmented Reality)-Everything about MR (Mixed Reality)-Block chain Identity Management in Metaverse -NFT (non-fungible token) for Metaverse-Introduction to NFTs-History of NFTs-Benefits of NFTs	08	
V	USE-CASES : Gaming in Metaverse-Meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse-e-commerce in Metaverse-Travel in Metaverse- Personalized Avatars-Digital Identity in Metaverse	08	
Text Books:			
<ol style="list-style-type: none"> 1. The Metaverse: And How It Will Revolutionize Everything Kindle Edition by Matthew Ball , Publisher : Liveright ,2022 2. The Metaverse Handbook: Innovating for the Internet;s Next Tectonic Shift Kindle Edition by QuHarrison Terry (Author), Scott Keeney (Author), Paris Hilton (Foreword), Publisher: Wiley; 1st edition ,2022 1. The Wearable Technology Handbook, Haider Raad,scholar publcialtions,2017 2. Metaverse Made Easy: A Beginner's Guide to the Metaverse, Dr.Liew Voon Kiong,Publisher, Liew Voon Kiong, 2022 3. Metaverse For Beginners and Advanced: A Complete Journey Into the Metaverse Virtual World (Web 3.0), Darell Freeman,Publisher Darell Freeman,2022 4. Metaverse Glossary - Your Gateway to the Future , Ravindra Dastikop, Evincepub 			

Publishing,2022

5. The Metaverse: Prepare Now for the Next Big Thing Paperback , Terry Winters , Winters

media Publiaction 2021

KCS053 Computer Graphics		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Understand the graphics hardware used in field of computer graphics.	K ₂
CO 2	Understand the concept of graphics primitives such as lines and circle based on different algorithms.	K ₂ , K ₄
CO 3	Apply the 2D graphics transformations, composite transformation and Clipping concepts.	K ₄
CO 4	Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.	K ₂ , K ₃
CO 5	Perform the concept of projections, curve and hidden surfaces in real life.	K ₂ , K ₃
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	08
II	Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	08
III	Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	08
IV	Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	08
V	Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	08
Text books:		
1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education		
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education.		
3. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill		
4. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – Tata MCGraw Hill.		
5. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.		
6. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.		
7. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.		

KCS054 Object Oriented System Design		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Understand the application development and analyze the insights of object oriented programming to implement application	K ₂ , K ₄
CO 2	Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural)	K ₂ , K ₃
CO 3	Understand, analyze and apply oops concepts (i.e. abstraction, inheritance)	K ₂ , K ₃ , K ₄
CO 4	Understand the basic concepts of C++ to implement the object oriented concepts	K ₂ , K ₃
CO 5	To understand the object oriented approach to implement real world problem.	K ₂ , K ₃
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.	08
II	Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. Basic Behavioural Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.	08
III	Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.	08
IV	C++ Basics : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures C++ Functions : Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	08
V	Objects and Classes : Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion. Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class Polymorphism : Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	08
Text Books		
<ol style="list-style-type: none"> 1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI 2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education 3. Object Oriented Programming With C++, E Balagurusamy, TMH 4. C++ Programming, Black Book, Steven Holzner, dreamtech 		

5. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
6. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
7. The Complete Reference C++, Herbert Schilitz, TMH

KCS 055		Machine Learning Techniques
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able:		
CO 1	To understand the need for machine learning for various problem solving	K ₁ , K ₂
CO 2	To understand a wide variety of learning algorithms and how to evaluate models generated from data	K ₁ , K ₃
CO 3	To understand the latest trends in machine learning	K ₂ , K ₃
CO 4	To design appropriate machine learning algorithms and apply the algorithms to a real-world problems	K ₄ , K ₆
CO 5	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models	K ₄ , K ₅
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	INTRODUCTION – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	08
II	REGRESSION: Linear Regression and Logistic Regression BAYESIAN LEARNING - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussian kernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	08
III	DECISION TREE LEARNING - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	08
IV	ARTIFICIAL NEURAL NETWORKS – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; DEEP LEARNING - Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-driving car etc.	08
V	REINFORCEMENT LEARNING –Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning. GENETIC ALGORITHMS: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications.	08

Text books:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press 2004.

3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
5. M. Gopal, “Applied Machine Learning”, McGraw Hill Education

KCD052 Multimedia and Animation		
Course Outcome (CO)		Bloom’s Knowledge Level (KL)
At the end of course , the student will be able to :		
CO 1	To grasp the fundamental knowledge of Multimedia elements and systems	K ₁
CO 2	To get familiar with Multimedia file formats and standards	K ₂
CO 3	To learn the process of Authoring multimedia presentations	K ₃
CO 4	To learn the techniques of animation in 2D and 3D and for the mobile UI	K ₁ , K ₁
CO 5	To explore different popular applications of multimedia	K ₁ , K ₂
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	INTRODUCTION TO MULTIMEDIA: Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.	08
II	MULTIMEDIA FILE FORMATS AND STANDARDS File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.	08
III	MULTIMEDIA AUTHORIZING Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, simulations.	08
IV	ANIMATION Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.	08
V	MULTIMEDIA APPLICATIONS Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.	08
Text Books		
<ol style="list-style-type: none"> 1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia”, Third Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III) 2. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 		

3rd Edition, 2016.

3. Gerald Friedland, Ramesh Jain, “Multimedia Computing”, Cambridge University Press, 2018.
4. Prabhat K.Andleigh, Kiran Thakrar, “Multimedia System Design”, Pearson Education, 1st Edition, 2015.
5. Mohsen Amini Salehi, Xiangbo Li, “Multimedia Cloud Computing Systems”, Springer Nature, 1st Edition, 2021.
6. Mark Gaimbruno, “3D Graphics and Animation”, Second Edition, New Riders, 2002.
7. Rogers David, “Animation: Master – A Complete Guide (Graphics Series)”, Charles River Media, 2006.
8. Rick parent, “Computer Animation: Algorithms and Techniques”, Morgan Kauffman, 3rd Edition, 2012.
9. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, “UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native”, Packt Publishing, 2022.

KCD053			Software Engineering		
Course Outcome (CO)			Bloom’s Knowledge Level (KL)		
At the end of course, the student will be able to					
CO 1	Explain various software characteristics and analyze different software Development Models.			K ₁ , K ₂	
CO 2	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.			K ₁ , K ₂	
CO 3	Compare and contrast various methods for software design			K ₂ , K ₃	
CO 4	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.			K ₃	
CO 5	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.			K ₅	
DETAILED SYLLABUS					3-1-0
Unit	Topic				Proposed Lecture
I	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.				08
II	Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.				08
III	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead’s Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.				08
IV	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing,				08

	Regression Testing, Testing for Functionality and Testing for Performance, TopDown and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	
V	Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	08

Text books:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

KCS058 Human Computer Interface		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO 1	Understand and analyze the common methods in the user-centered design process and the appropriateness of individual methods for a given problem.	K ₂ , K ₄
CO 2	Apply , adapt and extend classic design standards, guidelines, and patterns.	K ₃ , K ₅
CO 3	Employ selected design methods and evaluation methods at a basic level of competence.	K ₄ , K ₅
CO 4	Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.	K ₄ , K ₅
CO 5	Demonstrate sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.	K ₃ , K ₄
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Importance of user Interface – definition, importance of 8 good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	08
II	Design process: Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions. III Screen Designing : Design goals – Scre	08
III	Screen Designing : Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	08
IV	Windows : New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	08
V	Software tools : Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	08
Text books:		
<ol style="list-style-type: none"> 1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004. 2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010. 3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co. 4. Samit Bhattacharya, “Human-Computer Interaction: User-Centric Computing for Design”, McGraw Hill 		

Course Outcome (CO)

Bloom's Knowledge Level (KL)

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

CO 1	Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.	K ₂ , K ₄
CO 2	Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system.	K ₃ , K ₅ , K ₆
CO 3	Write and execute simple and complex queries using DDL, DML, DCL and TCL	K ₄ , K ₅
CO 4	Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.	K ₄ , K ₅
CO 5	Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.	K ₃ , K ₄

DETAILED SYLLABUS

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
 - a) Writing basic SQL SELECT statements.
 - b) Restricting and sorting data.
 - c) Displaying data from multiple tables.
 - d) Aggregating data using group function.
 - e) Manipulating data.
 - e) Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files
12. Mini project (Design & Development of Data and Application) for following :
 - a) Inventory Control System.
 - b) Material Requirement Processing.
 - c) Hospital Management System.
 - d) Railway Reservation System.
 - e) Personal Information System.
 - f) Web Based User Identification System.
 - g) Timetable Management System.
 - h) Hotel Management System


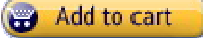
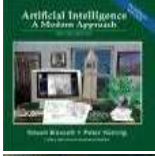





Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner

It is also suggested that open source tools should be preferred to conduct the lab (MySQL , SQL server , Oracle ,MongoDB ,Cubrid ,MariaDBetc)

List of Experiments (Indicative & not limited to)

Experiment No.	List of Experiments (Indicative & not limited to)															
1	<p>Design the following static web pages required for an online bookstore website.</p> <p>HOME PAGE:</p> <ul style="list-style-type: none"> ✚ The static home page must contain three frames. ✚ Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). <p>For example: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame. Right frame: The <i>pages to the links in the left frame must be loaded here</i>. Initially this page contains description of the web site.</p> <table border="1" data-bbox="313 856 1490 1100"> <thead> <tr> <th data-bbox="313 856 500 909">Logo</th> <th colspan="4" data-bbox="500 856 1490 909">Web Site Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="313 909 500 957">Home</td> <td data-bbox="500 909 786 957">Login</td> <td data-bbox="786 909 1019 957">Registration</td> <td data-bbox="1019 909 1278 957">Catalogue</td> <td data-bbox="1278 909 1490 957">Cart</td> </tr> <tr> <td data-bbox="313 957 500 1100">CSE ECE EEE CIVIL</td> <td colspan="4" data-bbox="500 957 1490 1100" style="text-align: center;">Description of the WebSite</td> </tr> </tbody> </table>	Logo	Web Site Name				Home	Login	Registration	Catalogue	Cart	CSE ECE EEE CIVIL	Description of the WebSite			
Logo	Web Site Name															
Home	Login	Registration	Catalogue	Cart												
CSE ECE EEE CIVIL	Description of the WebSite															
2.	<p>LOGIN PAGE:</p> <p>This page looks like below:</p> <table border="1" data-bbox="313 1234 1490 1745"> <thead> <tr> <th data-bbox="313 1234 500 1297">Logo</th> <th colspan="4" data-bbox="500 1234 1490 1297">WebSite Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="313 1297 500 1371">Home</td> <td data-bbox="500 1297 786 1371">Login</td> <td data-bbox="786 1297 1019 1371">Registration</td> <td data-bbox="1019 1297 1278 1371">Catalogue</td> <td data-bbox="1278 1297 1490 1371">Cart</td> </tr> <tr> <td data-bbox="313 1371 500 1745">CSE ECE EEE CIVIL</td> <td colspan="4" data-bbox="500 1371 1490 1745" style="text-align: center;"> <p>Login Page</p> <p>User Name: <input type="text"/></p> <p>Passwords: <input type="password"/></p> <p style="text-align: right;"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p> </td> </tr> </tbody> </table>	Logo	WebSite Name				Home	Login	Registration	Catalogue	Cart	CSE ECE EEE CIVIL	<p>Login Page</p> <p>User Name: <input type="text"/></p> <p>Passwords: <input type="password"/></p> <p style="text-align: right;"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p>			
Logo	WebSite Name															
Home	Login	Registration	Catalogue	Cart												
CSE ECE EEE CIVIL	<p>Login Page</p> <p>User Name: <input type="text"/></p> <p>Passwords: <input type="password"/></p> <p style="text-align: right;"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p>															
3.	<p>CATALOGUE PAGE: The catalogue page should contain the details of all the books available in the website in a table. The details should contain the following:</p> <ol style="list-style-type: none"> 1. Snap shot of Cover Page. 2. Author Name. 3. Publisher. 															

4. Price.
5. Add to cart button.

Logo	WebSite Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book:XMLBible Author : Winston Publication:Wiely	\$40.5	
ECE				
EEE		Book :AI Author:S.Russel Publication:Princetonhall	\$63	
CIVIL				
		Book : Java 2 Author:Watson Publication:BPBpublications	\$35.5	
		Book : HTML in 24 hours Author : Sam Peter Publication:Sampublication	\$50	

CARTPAGE: The cart page contains the details about the books which are added to the cart. The cart page should look like this:

4.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE	Book name	Price	Quantity	Amount
ECE	Java 2	\$35.5	2	\$70
EEE	XML bible	\$40.5	1	\$40.5
CIVIL	Total amount	- \$130.5		

5.

REGISTRATION PAGE : Create a“ registration form“ with the following fields

- 1)Name (Text field)
- 2)Password (password field)
- 3) E-mailid(text field)
- 4) Phone Number(text field)
- 5) Sex(radio button)
- 6) Date of birth(3 select boxes)
- 7) Languages known(checkboxes–English, Telugu, Hindi, Tamil)
- 8) Address(text area)

6.

Js VALIDATION: Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).

	2. Password (Password should not be less than 6 characters length).
7.	<p>Js VALIDATION:</p> <p>3. E-mailid (should not contain any invalid and must follow the standard pattern(name@domain.com))</p> <p>4. Phone Number(Phone number should contain 10 digits only).</p>
8.	<p>CSS: Design a web page using CSS(Cascading Style Sheets) which includes the following:</p> <p>1) Use different font, styles: In the style definition you define how each selector should work(font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.</p> <p>2) Set a background image for both the page and single elements on the page.</p>
9.	<p>CSS:</p> <p>1) Control the repetition of the image with the background-repeat property.</p> <p>2) Define styles for links as</p> <p>A:link</p> <p>A:visited</p> <p>A:active</p> <p>A:hover</p>
10.	<p>Consider a small topic of your choice on which you can develop static Webpages and try to implement all topics of html, CSS and Js within the topic.</p> <p>Choose any one topic.</p> <ol style="list-style-type: none"> 1. Your Own Portfolio 2. To-Do List 3. Survey Form 4. A Tribute Page 5. A Questionnaire

KCS553		Design and Analysis of Algorithm Lab	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to:			
CO 1	Implement algorithm to solve problems by iterative approach.	K ₂ , K ₄	
CO 2	Implement algorithm to solve problems by divide and conquer approach	K ₃ , K ₅	
CO 3	Implement algorithm to solve problems by Greedy algorithm approach.	K ₄ , K ₅	
CO 4	Implement algorithm to solve problems by Dynamic programming, backtracking, branch and bound approach.	K ₄ , K ₅	
CO 5	Implement algorithm to solve problems by branch and bound approach.	K ₃ , K ₄	
DETAILED SYLLABUS			
<ol style="list-style-type: none"> 1. Program for Recursive Binary & Linear Search. 2. Program for Heap Sort. 3. Program for Merge Sort. 4. Program for Selection Sort. 5. Program for Insertion Sort. 6. Program for Quick Sort. 7. Knapsack Problem using Greedy Solution 8. Perform Travelling Salesman Problem 9. Find Minimum Spanning Tree using Kruskal's Algorithm 10. Implement N Queen Problem using Backtracking 11. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n > 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case. 12. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n > 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case. 13.6. Implement , the 0/1 Knapsack problem using <ol style="list-style-type: none"> (a) Dynamic Programming method (b) Greedy method. 14. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. 15. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program. 16. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm. 17. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm. <ol style="list-style-type: none"> (b) Implement Travelling Sales Person problem using Dynamic programming. 18. Design and implement to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1,2,6\}$ and $\{1,8\}$. Display a suitable message, if the given problem instance doesn't have a solution. 19. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle. 			
<p>Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (C, C++ etc)</p>			

B.TECH. (CSD)
SIXTH SEMESTER (DETAILED SYLLABUS)

KCD 601		Augmented & Virtual Reality	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able :			
CO 1	To make students know the basic concept and understand the framework of virtual reality.	K ₁ , K ₂	
CO 2	To understand principles and multidisciplinary features of virtual reality and apply it in developing applications.	K ₂ , K ₄	
CO 3	To know the technology for multimodal user interaction and perception VR, in particular the visual, audial and haptic interface and behavior.	K ₂ , K ₃	
CO 4	To understand and apply technology for managing large scale VR environment in real time.	K ₂ , K ₃	
CO 5	To understand an introduction to the AR system framework and apply AR tools in software development.	K ₂ , K ₃ ,	
DETAILED SYLLABUS			3-0-0
Unit	Topic	Proposed Lecture	
I	VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.	08	
II	3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	08	
III	SOFTWARE TECHNOLOGIES: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	08	
IV	3D INTERACTION TECHNIQUES: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestural	08	

	<p>Commands, Tools, Multimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry .</p> <p>DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation.</p> <p>VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.</p>	
V	<p>Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.</p>	08

Text books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, “Designing Virtual Systems: The Structured Approach”, 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”, Addison Wesley, USA, 2005.
4. Chetankumar G Shetty, “Augmented Reality: Theory, Design and Development”, McGraw Hill
5. Oliver Bimber and Ramesh Raskar, “Spatial Augmented Reality: Merging Real and Virtual Worlds”, 2005.
6. Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003.
7. John Vince, “Virtual Reality Systems”, Addison Wesley, 1995.
8. Howard Rheingold, “Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society”, Simon and Schuster, 1991.
9. William R Sherman and Alan B Craig, “Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)”. Morgan Kaufmann Publishers, San Francisco, CA, 2002
10. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

KCS602			Web Technology		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able to					
CO 1	Explain web development Strategies and Protocols governing Web.			K ₁ , K ₂	
CO 2	Develop Java programs for window/web-based applications.			K ₂ , K ₃	
CO 3	Design web pages using HTML, XML, CSS and JavaScript.			K ₂ , K ₃	
CO 4	Creation of client-server environment using socket programming			K ₁ , K ₂ ,	
CO 5	Building enterprise level applications and manipulate web databases using JDBC			K ₃ , K ₄	
CO6	Design interactive web applications using Servlets and JSP			K ₂ , K ₃	
DETAILED SYLLABUS					3-0-0
Unit	Topic			Proposed Lecture	
I	Introduction: Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers			08	
II	Web Page Designing: HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML			08	
III	Scripting: Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, Networking : Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.			08	
IV	Enterprise Java Bean: Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.			08	
V	Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session Java Server Pages (JSP): Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..			08	
Text books:					
1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley					
2. Xavier, C, " Web Technology and Design" , New Age International					
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication					
4. Bhave, "Programming with Java", Pearson Education					
5. Herbert Schildt, "The Complete Reference:Java", TMH.					
6. Hans Bergsten, "Java Server Pages", SPD O'Reilly					
7. Margaret Levine Young, "The Complete Reference Internet", TMH					
8. Naughton, Schildt, "The Complete Reference JAVA2", TMH					
9. Balagurusamy E, "Programming in JAVA", TMH					

KCS603 Computer Networks		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission	K ₁ ,K ₂
CO2	Apply channel allocation, framing, error and flow control techniques.	K ₃
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.	K ₂ ,K ₃
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	K ₂ ,K ₃
CO5	Explain the functions offered by session and presentation layer and their Implementation.	K ₂ ,K ₃
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.	K ₂
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. Physical Layer: Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	08
II	Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	08
III	Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	08
IV	Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	08
V	Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.	08
Text books:		
Text books and References:		
<ol style="list-style-type: none"> Behrouz Forouzan, "Data Communication and Networking", McGraw Hill Andrew Tanenbaum "Computer Networks", Prentice Hall. William Stallings, "Data and Computer Communication", Pearson. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann W. A. Shay, "Understanding Communications and Networks", Cengage Learning. D. Comer, "Computer Networks and Internets", Pearson. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill. 		

KCS061			Big Data		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able to					
CO 1	Demonstrate knowledge of Big Data Analytics concepts and its applications in business.			K ₁ ,K ₂	
CO 2	Demonstrate functions and components of Map Reduce Framework and HDFS.			K ₁ ,K ₂	
CO 3	Discuss Data Management concepts in NoSQL environment.			K ₆	
CO 4	Explain process of developing Map Reduce based distributed processing applications.			K ₂ ,K ₅	
CO 5	Explain process of developing applications using HBASE, Hive, Pig etc.			K ₂ ,K ₅	
DETAILED SYLLABUS				3-0-0	
Unit	Topic			Proposed Lectures	
I	Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.			06	
II	Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. Map Reduce: Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce			08	
III	HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud			08	
IV	Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. NoSQL Databases: Introduction to NoSQL MongoDB: Introduction, data types, creating, updating and deleting documents, querying, introduction to indexing, capped collections Spark: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN SCALA: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.			09	
V	Hadoop Eco System Frameworks: Applications on Big Data using Pig, Hive and HBase Pig - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators,			09	

Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries.

HBase – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper.

IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.

Text books and References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, "Big Data Fundamentals: Concepts, Drivers and Techniques", Prentice Hall.
5. Raj Kamal, Preeti Saxena, "Big Data Analytics", McGraw Hill Education
6. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons
7. ArshdeepBahga, Vijay Madiseti, "Big Data Science & Analytics: A HandsOn Approach ", VPT
8. Anil Maheshwari, "Big Data", Second Edition, McGraw Hill
9. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP
10. Tom White, "Hadoop: The Definitive Guide", O'Reilly.
11. Eric Sammer, "Hadoop Operations", O'Reilly.
12. Chuck Lam, "Hadoop in Action", MANNING Publishers
13. Deepak Vohra, "Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools", Apress
14. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly
15. Lars George, "HBase: The Definitive Guide", O'Reilly.
16. Alan Gates, "Programming Pig", O'Reilly.
17. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer
18. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons
19. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons
20. Pete Warden, "Big Data Glossary", O'Reilly

KCS062			Image Processing		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able:					
CO 1	Explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.			K ₁ , K ₂	
CO 2	Apply image processing techniques for image enhancement in both the spatial and frequency domains.			K ₂ , K ₃	
CO 3	Apply and compare image restoration techniques in both spatial and frequency domain.			K ₂ , K ₃	
CO 4	Compare edge based and region based segmentation algorithms for ROI extraction.			K ₃ , K ₄	
CO 5	Explain compression techniques and descriptors for image processing.			K ₂ , K ₃	
DETAILED SYLLABUS					3-0-0
Unit	Topic				Proposed Lecture
I	DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.				08
II	IMAGE ENHANCEMENT: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.				08
III	IMAGE RESTORATION: Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering				08
IV	IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.				08
V	IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.				08
Text books:					
1.Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010					
2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.					
3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.					
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011.					
5. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.					
6. William K. Pratt, Digital Image Processing John Wiley, New York, 2002					
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999					

KCD061			Digital Marketing		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able:					
CO 1	To examine and explore the role and importance of digital marketing in today's rapidly changing business environment..			K ₃	
CO 2	To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.			K ₂	
CO 3	To know the key elements of a digital marketing strategy.			K ₃	
CO 4	To study how the effectiveness of a digital marketing campaign can be measured			K ₂	
CO 5	o demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.			K ₂ , K ₃	
DETAILED SYLLABUS					3-0-0
Unit	Topic				Proposed Lecture
I	INTRODUCTION TO ONLINE MARKET Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing				05
II	SEARCH ENGINE OPTIMISATION Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement				09
III	E- MAIL MARKETING E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns- Profiling and targeting				09
IV	SOCIAL MEDIA MARKETING Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.				09
V	DIGITAL TRANSFORMATION Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing				08
Text books:					
<ol style="list-style-type: none"> 1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373. 2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449 3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930. 4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited. 5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning. 					

KCD062			Game Design		
Course Outcome (CO)			Bloom's Knowledge Level (KL)		
At the end of course , the student will be able to					
CO 1	Use the Fundamental principles of Game Design and Development in context			K ₁ , K ₂	
CO 2	Able to apply AI techniques in Game Design and Development			K ₂	
CO 3	Thoroughly understand the detailed processes of the Game Engine			K ₂ , K ₃	
CO 4	Design and Implement simple 2D games using the design and development process learnt			K ₂ , K ₃	
CO 5	Design and Implement simple 3D games using the design and development process learnt			K ₂ ,K ₃	
DETAILED SYLLABUS					3-0-0
Unit	Topic				Proposed Lecture
I	GAME DESIGN FUNDAMENTALS Role of Game Designer, Structure of Games, major genres, game concepts, game worlds, working with formal elements, dramatic elements and system dynamics, storytelling, game play, core mechanics, game balancing, principles of Level Design, Conceptualization, prototyping, playtesting.				08
II	GAME AI Game AI, AI model, algorithms for Movement, Path finding, Decision making, Tactical and Strategic AI, Procedural Content Generation, Board Games				08
III	GAME ENGINE Rendering engine and pipeline, Scene Graph, Level of Detail, sorting, Animation Systems, Collision and Rigid Body dynamics.				08
IV	2D GAME DESIGN AND IMPLEMENTATION GoDot game engine Designing and Prototyping a simple 2D Game, including character design, storytelling, levels. Implementing the Game in pygame or Godot engine or equivalent.				08
V	3D GAME DESIGN AND IMPLEMENTATION Designing and Prototyping a simple 3D Game, including character design, storytelling, levels. Implementing the Game in pygame or Godot engine or Blender or equivalent.				08
Text books:					
<ol style="list-style-type: none"> 1. Ernest Adams, “Fundamentals of Game Design”, 3rd Edition, Pearson Education, 2015. (Unit-I) 2. Ian Millington, “AI for Games”, CRC Press, 3rd edition, 2019. (Unit-II) 3. Jung Hyun Han, “3D Graphics for Game Programming”, Delmar Cengage Learning, 2011.(Unit-III) 					

KCD651		Augmented & Virtual Reality Lab	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to			
CO 1	Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement	K ₂ , K ₄	
CO 2	Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship	K ₃ , K ₅	
CO 3	Draw a class diagram after identifying classes and association among them	K ₄ , K ₅	
CO 4	Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially	K ₄ , K ₅	
CO 5	Able to use modern engineering tools for specification, design, implementation and testing	K ₃ , K ₄	
DETAILED SYLLABUS			
<p>For any given case/ problem statement do the following;</p> <ol style="list-style-type: none"> 1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender. 2. Use the primitive objects and apply various projection methods by handling camera. 3. Download objects from asset store and apply various lighting and shading effects. 4. Model three dimensional objects using various modeling techniques and apply textures over them. 5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity. 6. Add audio and text special effects to the developed application. 7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity. 8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places. 9. Develop MR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation. 10. Develop simple MR enabled gaming applications. 			
Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner			

KCS652		Web Technology Lab	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to			
CO 1	Develop static web pages using HTML	K ₂ , K ₃	
CO 2	Develop Java programs for window/web-based applications.	K ₂ , K ₃	
CO 3	Design dynamic web pages using Javascript and XML.	K ₃ , K ₄	
CO 4	Design dynamic web page using server site programming Ex. ASP/JSP/PHP	K ₃ , K ₄	
CO 5	Design server site applications using JDDC,ODBC and session tracking API	K ₃ , K ₄	
DETAILED SYLLABUS			
<p>This lab is based on the Web Technologies. Some examples are as follows:</p> <ol style="list-style-type: none"> 1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject 2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access. 3. Write programs using Java script for Web Page to display browsers information. 5. Write a Java applet to display the Application Program screen i.e. calculator and other. 6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer. 7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket. 8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed. 9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies. 10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page. 11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database 12. Design and implement a simple shopping cart example with session tracking API. 			
<p>Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (Java , JSP , Bootstrap Firebug , WampServer , MongoDB, etc)</p>			

KCS663 Computer Networks Lab		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO 1	Simulate different network topologies.	K ₃ , K ₄
CO 2	Implement various framing methods of Data Link Layer.	K ₃ , K ₄
CO 3	Implement various Error and flow control techniques.	K ₃ , K ₄
CO 4	Implement network routing and addressing techniques.	K ₃ , K ₄
CO 5	Implement transport and security mechanisms	K ₃ , K ₄
DETAILED SYLLABUS		
<ol style="list-style-type: none"> 1. Implementation of Stop and Wait Protocol and Sliding Window Protocol. 2. Study of Socket Programming and Client – Server model 3. Write a code simulating ARP /RARP protocols. 4. Write a code simulating PING and TRACEROUTE commands 5. Create a socket for HTTP for web page upload and download. 6. Write a program to implement RPC (Remote Procedure Call) 7. Implementation of Subnetting . 8. Applications using TCP Sockets like <ol style="list-style-type: none"> a. Echo client and echo server b. Chat c. File Transfer 9. Applications using TCP and UDP Sockets like <ol style="list-style-type: none"> d. DNS e. SNMP f. File Transfer 10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS 11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. <ol style="list-style-type: none"> i. Link State routing ii. Flooding iii. Distance vector 12. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc. 13. Configuration of router, hub, switch etc. (using real devices or simulators) 14. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc. 15. Network packet analysis using tools like Wireshark, tcpdump, etc. 16. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc. 17. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers) 		
<p>Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (C , C++ , Java , NS3, Mininet, Opnet, TCP Dump, Wireshark etc.</p>		