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

Evaluation Scheme & Syllabus

For

B.Tech. 2nd Year

(Computer Science and Engineering/CS/CSIT)

On

AICTE Model Curriculum

(Effective from the Session: 2019-20)

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

B.TECH (COMPUTER SCIENCE AND ENGINEERING)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ KAS302	Engineering Science Course/Maths IV	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE 301	Technical Communication/Universal Human values	2 3	1 0	0 0	30	20	50		100		150	3
3	KCS301	Data Structure	3	1	0	30	20	50		100		150	4
4	KCS302	Computer Organization and Architecture	3	1	0	30	20	50		100		150	4
5	KCS303	Discrete Structures & Theory of Logic	3	0	0	30	20	50		100		150	3
6	KCS351	Data Structures Using C Lab	0	0	2				25		25	50	1
7	KCS352	Computer Organization Lab	0	0	2				25		25	50	1
8	KCS353	Discrete Structure & Logic Lab	0	0	2				25		25	50	1
9	KCS354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										**950**	**22**

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS301	Universal Human Values/ Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KCS401	Operating Systems	3	0	0	30	20	50		100		150	3
4	KCS402	Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5	KCS403	Microprocessor	3	1	0	30	20	50		100		150	4
6	KCS451	Operating Systems Lab	0	0	2				25		25	50	1
7	KCS452	Microprocessor Lab	0	0	2				25		25	50	1
8	KCS453	Python Language Programming Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										**900**	**21**

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

EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. THIRD YEAR

Computer Science
Computer Engineering
Computer Science and Engineering
(Computer Science and Engineering/CS)

On

Choice Based Credit System

(Effective from the Session: 2020-21)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY,
UTTAR PRADESH, LUCKNOW

B.TECH (COMPUTER SCIENCE & ENGINEERING/ COMPUTER SCIENCE)
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	KCS502	Compiler Design	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	Deptt. Elective-I	Departmental Elective-I	3	0	0	30	20	50		100		150	3
5	Deptt. 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	KCS552	Compiler Design 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	KCS601	Software Engineering	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	KCS651	Software Engineering 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. KCS-051 Data Analytics
2. KCS-052 Web Designing
3. KCS-053 Computer Graphics
4. KCS-054 Object Oriented System Design

Departmental Elective-II

1. KCS-055 Machine Learning Techniques
2. KCS-056 Application of Soft Computing
3. KCS-057 Augmented & Virtual Reality
4. KCS-058 Human Computer Interface

Departmental Elective-III

1. KCS-061 Big Data
2. KCS-062 Image Processing
3. KCS-063 Real Time Systems
4. KCS-064 Data Compression

B.TECH. (CSE & CS)

FIFTH SEMESTER (DETAILED SYLLABUS)

Database Management System (KCS501)		
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:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision 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", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH

Compiler Design (KCS-502)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.	K_3, K_6
CO 2	Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.	K_2, K_6
CO 3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	K_4, K_5
CO 4	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.	K_2, K_3
CO 5	Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.	K_2, K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

Text books:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, McGraw-Hill,2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5. V Raghvan, " Principles of Compiler Design", McGraw-Hill,
6. Kenneth Louden," Compiler Construction", Cengage Learning.
7. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Design and Analysis of Algorithm (KCS503)		
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:

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.
11. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

Data Analytics (KCS-051)		
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. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education

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

Web Designing (KCS-052)		
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	Understand 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 :** Basic principles involved in developing a web site, Planning process , Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, **Introduction to HTML:** What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document , Mark up Tags , Heading-Paragraphs , Line Breaks	**08**
II	**Elements of HTML:** HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	**08**
III	**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) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color , Creating page Layout and Site Designs.	**08**
IV	Introduction to Client Side Scripting , Introduction to Java Script , Javascript Types , Variables in JS, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Related Examples	**08**
V	**Web Hosting:** Web Hosting Basics , Types of Hosting Packages, Registering domains , Defining Name Servers , Using Control Panel, Creating Emails in Cpanel , Using FTP Client, Maintaining a Website **Concepts of SEO :** Basics of SEO, Importance of SEO, Onpage Optimization Basics	**08**

Text Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

Computer Graphics (KCS-053)		
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" – McGraw Hill.
5. Amrendra N Sinha and Arun D Udai," Computer Graphics", McGraw Hill.
6. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
7. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
8. Donald Hearn and M Pauline Baker, "Computer Graphics with Open GL", Pearson education

Object Oriented System Design (KCS-054)		
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

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", Pearson Education
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Object Oriented Programming With C++, E Balagurusamy, McGraw Hill.
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 Compete Reference C++, Herbert Schlitz, McGraw Hill.

Machine Learning Techniques (KCS 055)		
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 Gaussiankernel), 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-deriving 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), The 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.

Application of Soft Computing (KCS- 056)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to :		
CO 1	Recognize the feasibility of applying a soft computing methodology for a particular problem	K_2, K_4
CO 2	Understand the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.	K2,K_4, K_6
CO 3	Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem.	K_3, K_5
CO 4	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems	K_3, K_4
CO 5	Apply genetic algorithms to combinatorial optimization problems	K3, K5

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Neural Networks-I (Introduction & Architecture) :** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	**08**
II	**Neural Networks-II (Back propagation networks):** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.	**08**
III	**Fuzzy Logic-I (Introduction):** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	**08**
IV	**Fuzzy Logic –II (Fuzzy Membership, Rules)** : Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications	**08**
V	**Genetic Algorithm(GA):** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	**08**

Text books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N. P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press. Reference Books:
3. Siman Haykin, "Neural Netowrks", Pearson Education
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" McGraw Hill

Augmented & Virtual Reality (KCS- 057)		
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, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry .	**08**

	DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. **VIRTUAL REALITY APPLICATIONS:** Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	
V	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.	**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. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.

5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

6. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.

7. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.

8. 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

9. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Human Computer Interface (KCS- 058)		
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:

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.

Database Management Systems Lab (KCS-551)

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.	K3, K5, K6
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)

Database Management Systems Lab (KCS-551): Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Database Management Lab (KCS-551)	Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
	Data Manipulation Language(DML) Statements
	Data Query Language(DQL) Statements: (Select statement with operations like Where clause, Order by, Logical operators, Scalar functions and Aggregate functions)
	Transaction Control Language(TCL) statements: (Commit(make changes permanent), Rollback (undo)
	Describe statement: To view the structure of the table created

COMPILER DESIGN LAB (KCS-552)

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Identify patterns, tokens & regular expressions for lexical analysis.	K_2, K_4
CO 2	Design Lexical analyser for given language using C and LEX /YACC tools	K_3, K_5
CO 3	Design and analyze top down and bottom up parsers.	K_4, K_5
CO 4	Generate the intermediate code	K_4, K_5
CO 5	Generate machine code from the intermediate code forms	K_3, K_4

DETAILED SYLLABUS

1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.
2. Implementation of Lexical Analyzer using Lex Tool
3. Generate YACC specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +, – , * and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
   c) Implementation of Calculator using LEX and YACC
   d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree
4. Write program to find ε – closure of all states of any given NFA with ε transition.
5. Write program to convert NFA with ε transition to NFA without ε transition.
6. Write program to convert NFA to DFA
7. Write program to minimize any given DFA.
8. Develop an operator precedence parser for a given language.
9. Write program to find Simulate First and Follow of any given grammar.
10. Construct a recursive descent parser for an expression.
11. Construct a Shift Reduce Parser for a given language.
12. Write a program to perform loop unrolling.
13. Write a program to perform constant propagation.
14. Implement Intermediate code generation for simple expressions.
15. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.

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++ , Lex or Flex and YACC tools (Unix/Linux utilities)etc)

Design and Analysis of Algorithm Lab (KCS-553)		
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

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
   (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.
   (b) Implement Travelling Sales Person problem using Dynamic programming.
18. Design and implement to find a subset of a given set S = {Sl, S2,.....,Sn} 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.

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)

COMPUTER SCIENCE AND ENGINEERING/CS

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. FOURTH (IV) YEAR

(COMPUTER SCIENCE AND ENGINEERING/CS)

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2021-22]

COMPUTER SCIENCE AND ENGINEERING/CS

B.TECH

(COMPUTER SCIENCE & ENGINEERING/CS) CURRICULUM STRUCTURE

SEMESTER- VII													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KHU701/KHU702	HSMC -1 / HSMC-2	3	0	0	30	20	50		100		150	3
2	KCS07X	Departmental Elective-IV	3	0	0	30	20	50		100		150	3
3	KCS07X	Departmental Elective-V	3	0	0	30	20	50		100		150	3
4	KOE07X	Open Elective-II	3	0	0	30	20	50		100		150	3
5	KCS751A	The Department may conduct one Lab of either of the two Electives (4 or 5) based on the elective chosen for the curriculum. The Department shall on its own prepare complete list of practical for the Lab and arrange for proper setup and conduct accordingly.	0	0	2				25		25	50	1
6	KCS752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KCS753	Project	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		Total	**12**	**0**	**12**							**850**	**18**

*The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

SEMESTER- VIII													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KHU801/KHU802	HSMC-1#/HSMC-2#	3	0	0	30	20	50		100		150	3
2	KOE08X	Open Elective-III	3	0	0	30	20	50		100		150	3
3	KOE08X	Open Elective-IV	3	0	0	30	20	50		100		150	3
4	KCS851	Project 1	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	**9**	**0**	**18**							**850**	**18**

COMPUTER SCIENCE AND ENGINEERING/CS

Departmental Elective-IV

1. KCS071 Artificial Intelligence
2. KCS072 Natural language processing
3. KCS073 High Performance Computing
4. KCS074 Cryptography and Network Security
5. KCS075 Design & Development of Applications
6. KCS076 Software Testing
7. KCS077 Distributed Systems

Departmental Elective-V

1. KCS078 Deep Learning
2. KCS079 Service Oriented Architecture
3. KCS710 Quantum Computing
4. KCS711 Mobile Computing
5. KCS712 Internet of Things
6. KCS713 Cloud Computing
7. KCS714 Blockchain Architecture Design

B.TECH. (CSE/CS)

SEVENT SEMESTER (DETAILED SYLLABUS)

Artificial Intelligence (KCS071)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents.	K_2
CO 2	Understand search techniques and gaming theory.	K_2, K_3
CO 3	The student will learn to apply knowledge representation techniques and problem solving strategies to common AI applications.	K_3 , K_4
CO 4	Student should be aware of techniques used for classification and clustering.	K_2 , K_3
CO 5	Student should aware of basics of pattern recognition and steps required for it.	K_2 , K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION :** Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.	**08**
II	**PROBLEM SOLVING METHODS:** Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games	**08**
III	**KNOWLEDGE REPRESENTATION:** First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information	**08**
IV	**SOFTWARE AGENTS:** Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.	**08**
V	**APPLICATIONS:** AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving	**08**

Text books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.First Edition, 2008
4. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
5. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
6. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
7. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

Block chain Architecture Design (KCS714)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Describe the basic understanding of Blockchain architecture along with its primitive.	K_1, K_2
CO 2	Explain the requirements for basic protocol along with scalability aspects.	K_2, K_3
CO 3	Design and deploy the consensus process using frontend and backend.	K_3, K_4
CO 4	Apply Blockchain techniques for different use cases like Finance, Trade/Supply and Government activities.	K_4, K_5

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Blockchain**: Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms	**08**
II	**Consensus:** Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains:Design goals, Consensus protocols for Permissioned Blockchains	**08**
III	**Hyperledger Fabric (A):** Decomposing the consensus process , Hyperledger fabric components, Chaincode Design and Implementation **Hyperledger Fabric (B):** Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool	**08**
IV	**Use case 1 :** Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance **Use case 2:** Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc	**08**
V	**Use case 3**: Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	**08**

Text books:

1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Cloud Computing (KCS713)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe architecture and underlying principles of cloud computing.	K_3
CO 2	Explain need, types and tools of Virtualization for cloud.	K_3, K_4
CO 3	Describe Services Oriented Architecture and various types of cloud services.	K_2, K_3
CO 4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.	K_2, K_4
CO 5	Analyze advanced cloud technologies.	K_3, K_6
DETAILED SYLLABUS		**3-1-0**

Unit	Topic	Proposed Lecture
I	**Introduction To Cloud Computing:** Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	08
II	**Cloud Enabling Technologies Service Oriented Architecture:** REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.	08
III	**Cloud Architecture, Services And Storage:** Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	08
IV	**Resource Management And Security In Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	08
V	**Cloud Technologies And Advancements Hadoop:** MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine –– Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	08

Text books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Cryptography & Network Security (KCS074)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques.	K2 , K3
CO 2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	K1 , K2
CO 3	Understand vulnerability assessments and the weakness of using passwords for authentication	K4
CO 4	Be able to perform simple vulnerability assessments and password audits	K3
CO 5	Summarize the intrusion detection and its solutions to overcome the attacks.	K2

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	**08**
II	Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA	**08**
III	Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA) Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,	**08**
IV	Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.	**08**
V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls	**08**

Text books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, McGraw Hill .
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", McGraw Hill

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

HUMANITIES, SCOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC COURSE)

&

OPEN ELECTIVES II LIST

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session:2021-22]

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. * It is mandatory that for these subjects (KOE069, KOE076, KOE087,KOE097 & KOE098) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

B.Tech. VII Semester (2021-22)

HUMANITIES, SCOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC COURSE) HSMC1/HSMC2

KHU701/ KHU801	RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING
KHU702/ KHU802	PROJECT MANAGEMENT & ENTREPRENEURSHIP

OPEN ELECTIVE-II

KOE071	FILTER DESIGN
KOE072	BIOECONOMICS
KOE073	MACHINE LEARNING
KOE074	RENEWABLE ENERGY RESOURCES
KOE075	OPERATIONS RESEARCH
KOE076	VISION FOR HUMANE SOCIETY
KOE077	DESIGN THINKING
KOE078	SOIL AND WATER CONSERVATION ENGINEERING
KOE079	INTRODUCTION TO WOMEN'S AND GENDER STUDIES

KHU701/ KHU801	**RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING**	**3L:0T:0P**	**3 Credits**

COURSE OUTCOME: After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development
2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.
4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning

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Unit	**Topics**	**Lectures**
I	**Rural Planning & Development:** Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.	8
II	**Rural Development Programmes:** Sriniketan experiment, Gurgaon experiment, marthandam experiment, Baroda experiment, Firkha development scheme, Etawa pilot project, Nilokheri experiment,approaches to rural community development: Tagore, Gandhi etc	8
III	**Panchayati Raj & Rural Administration:** Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.	8
IV	**Human Resource Development in Rural Sector:** Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities - Population composition.	8
V	**Rural Industrialization and Entrepreneurship:** Concept of Rural Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural Industrialization-Problems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.	8

Text Book:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz
2. Katar Singh: Rural Development in India – Theory History and Policy
3. TodaroM.P. Economic Development in III World war
4. Arora R.C – Integrated Rural Development in India
5. Dhandekar V.M and Rath N poverty in India
6. A.N.Agarwal and KundanaLal: Rural Economy of India
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

KOE074	**RENEWABLE ENERGY RESOURCES**	**3L:0T:0P**	**3 Credits**

Unit	Topics	Lectures
I	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	8
II	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energystorage for solar heating and cooling, limitations.	8
III	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	8
IV	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	8
V	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.	8

Text Book:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle," Renewable Energy Power For A Sustainable Future", Oxford University Press.