5KS01 Database Management Systems

Course Code:5KS01	Course Title: **Database Management Systems**	LTPC:L-4, C-4
Course Prerequisite:	Discrete Mathematics, Data Structures and Algorithm	
Course Objectives:	• To understand the fundamental concepts of database management system. • To learn database query languages. • To give systematic database design approaches covering conceptual design, logical design and an overview of physical design. • To understand the query processing and optimization. • To learn basics of transaction management and concurrency control.	
Course Outcomes(Expected Outcome):	On completion of the course, the students will be able to 1. Model, design and normalize databases for real life applications. 2. To learn data models, conceptualize and depict a database system using ER diagram. 3. Query Database applications using Query Languages like SQL. 4. Design & develop transaction processing approach for relational databases. 5. Understand validation framework like integrity constraints, triggers and assertions. This course meets the following student outcomes: 1. Design E-R Model for given requirements and convert the same into database tables. 2. Use database techniques such as SQL. 3. Explain transaction Management in relational database System. 4. Use advanced database Programming concepts	
Unit I:	Unit Title: : Introduction to DBMS	Hours:8
Database System Applications, Purpose of database systems, View of Data, Database Languages Database Architecture, Database Users and Administrators, Entity- Relationship Model, Constraints, Removing redundant attributes in Entity sets, E-R diagrams, Reduction to Relational Schemas, E-R design issues, Extended E-R Features		
Unit II:	Unit Title: Relational Algebra, SQL	Hours:8
Relational Model: Structure of Relational Databases, Database schema, keys, schema diagram, relational query languages, relational operators, The Relational Algebra,Overview of SQL query language, SQL data definition, Basic Structure of SQL queries, Additional basic operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the DatabaseOperations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database,Join expressions, Views		
Unit III:	Unit Title: Relational Database Design	Hours:8
Integrity Constraints, SQL data types and schemas, Authorization, Triggers, Features of good relational designs,atomic domains and First Normal Form, decomposition using functional		

dependencies, Functional dependency theory, Algorithms for decomposition, Decomposition using multivalued dependencies, More Normal Forms, Database Design Process.		
Unit IV:	Unit title :Query Processing and Query Optimization	Hours:8
Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Transformation of Relational Expressions ,Estimating Statistics of Expression Results, , Choice of Evaluation Plans, Materialized Views.		
Unit V:	Unit Title: Transaction Management	Hours:8
Transaction Concept, Simple transaction model, Storage structure, Transaction Atomicity and Durability, transaction isolation, Serializability, transaction isolation and atomicity, transaction isolation levels, Implementation of Isolation levels, Transactions as SQL statements		
Unit VI:	Unit Title: Concurrency Control and recovery system	Hours:8
Lock-Based Protocols, Deadlock Handling, Multiple Granularities, Timestamp- Based Protocols, Validation-Based Protocols, Multiversion schemes, Recovery system :Failure classification, Storage , Recovery & Atomicity, Recovery algorithm, buffer management, Failure with loss of nonvolatile storage , early lock release and logical undo operations, , Remote Backup Systems		
Text Book: Abraham Silberschatz, Henry F. Korth, S. Sudarshan, DATABASE SYSTEM CONCEPTS, Sixth Edition, McGraw Hill		
Reference Books: 1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill 2. Shamkant B. Navathe, RamezElmasri, Database Systems, Pearson Higher Education 3. Garcia-Molina, Ullman, Widom: Database System Implementation, Pearson education. 4. S. K. Singh: Database Systems, Concepts, Design and Applications, Pearson Education. 5. G.K. Gupta: Database Management Systems, McGraw Hill. 6. Toledo and Cushman: Database Management Systems, (Schaum's Outlines)		
Evaluation: Continuous Assessment (30 %) and Assignments / Quizzes / Projects (20%) Term End Examination (50%)-suggested		

Compiler Design

5KS02	Compiler Design	Lecture – 03 Hours/Week Tutorial – 00 Credit – 03
Course Prerequisite:	Basic knowledge of Discrete Mathematics, Theory of Computation	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Compiler Design by being able to do each of the following: 1. To learn concepts of programming language translation and phases of compiler design 2. To understand the common forms of parsers. 3. To study concept of syntax directed definition and translation scheme for the representation of language 4. To illustrate the various optimization techniques for designing various optimizing compilers	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Describe the fundamentals of compiler and various phases of compilers. 2. Design and implement LL and LR parsers 3. Solve the various parsing techniques like SLR,CLR,LALR. 4. Examine the concept of Syntax-Directed Definition and translation. 5. Assess the concept of Intermediate-Code Generation and run-time environment 6. Explain the concept code generation and code optimization.	
Unit I:	**Introduction to Compiler**	**Hours: 06**
Introduction to Compilers: Language Processor, The Structure of a Compiler. Lexical Analysis: The role of lexical analyzer, Input Buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator Lex, Finite Automata, From Regular Expressions to Finite Automata, State minimization of DFA.		
Unit II:		**Hours: 07**
Syntax Analysis: The role of the parser, Review of context free grammar for syntax analysis: Parse Tree and Derivation, Ambiguity in Grammar, Elimination of left recursion and left factoring. Top down parsing: recursive descent parsing, predictive parsers, Transition diagrams for predictive parsers, FIRST and FOLLOW, LL (1) Grammars, Construction of predictive parsing tables, Non recursive predictive parsing, Error recovery in predictive parsing.		
Unit III:		**Hours: 07**
Bottom up parsing: Handle pruning, Stack implementation of Shift Reduce Parsing, conflicts during shift reduce parsing Introduction to LR parsing: Simple LR, Items and the LR(0) Automation, The LR-Parsing algorithm, Construction of SLR parsing table, More powerful LR Parsers: canonical LR(1) Items, Constructing LR(1) sets of items and canonical LR(1) parsing tables, Constructing LALR parsing tables, The parser generator Yacc.		
Unit IV:		**Hours: 07**
Syntax Directed Translation: Syntax directed definitions, Inherited and synthesized attributes, Evaluation orders of SDD's: Dependency Graphs, S-attributed definitions, L-attributed definition. Application of Syntax-Directed Translation: Construction of syntax trees. Syntax-directed Translation Schemes.		
Unit V:		**Hours: 07**
Intermediate-Code Generation: Variants of Syntax Trees: Directed Acyclic Graphs(DAG), Three Address Code. Run Time Environments: Storage Organization, Static versus Dynamic Storage Organization, Stack Allocation of Space: Activation trees, Activation Records, Calling Sequences, Variable- Length data on stack. Access to Nonlocal Data on the Stack. Heap Manager: The Memory Manager. Introduction to Garbage Collection: Design Goals for Garbage Collectors.		
Unit VI:		**Hours:06**
Code Generation: Issues in Design of a Code generator, The Target Language, Address in the target code, Basic blocks and flow graphs. Optimization of Basic Blocks, Peephole Optimization and The Principal sources of Optimization.		

Text Books:

[1] Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman Compilers: ‐Principles, Techniques and Tools‖, Pearson Education Second Edition.

Reference Books:

[1] D. M. Dhamdhere, Compiler Construction—Principles and Practice, (2/e), Macmillan India.

[2] Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman Compilers: ‐Principles, Techniques and Tools‖, Pearson Education (Low Price Edition).

[3] Andrew Appel, Modern Compiler Implementation in C, Cambridge University press.

[4] K C. Louden ‐Compiler Construction—Principles and Practice‖ India Edition, CENGAGE.

[5] Bennett J.P., ‐Introduction to Compiling Techniques‖, 2/e (TMH).

Evaluation:

Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) **(Suggested)**

COMPUTER ARCHITECTURE & ORGANIZATION

5KS03	**Computer Architecture & Organization**	**L-3, T-0, C-3**
Course Prerequisite:	**Microprocessor & Assembly Language Programming**	
Objectives:	Students will be expected to demonstrate their understanding of Computer Architecture & Organization by being able to do each of the following: 1. To familiarize the basic concepts and structure of computers. 2. To Understand concepts of arithmetic operations. 3. To help students in understanding of addressing modes and memory organization. 4. To understand Conceptualize multitasking ability of a computer and pipelining 5. To facilitate students in learning IO communication	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Understand basic structure of computer. 2. Understand the basic operation of CPU. 3. Compare and select various Memory and I/O devices as per requirement. 4. Understand the concepts of number representation and their operation. 5. Understand the concept of parallel processing and pipelining.	
Unit I:	**Basic Structure of Computer**	**Hours: 7**
Basic Structure of Computer H/W & S/W: Functional Units, Basic Operational Concepts, Bus structures, Addressing Methods and Machine Program Sequencing: Memory Locations Addresses, Instruction and instruction sequencing, Addressing Modes. Basic I/O Operations.		
Unit II:	**Memory Unit**	**Hours: 7**
Basic Concepts, Memory Hierarchy, Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Dynamic Memories, Read Only Memories, Speed, Size and Cost.		
Unit III:	**Processing Unit**	**Hours: 8**
Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing.		
Unit IV:	**I/O Organization**	**Hours:6**
Accessing I/O Devices, Interrupts, Enabling and Disabling Inerrupts, Handling Multiple Devices, DMA,I/O Hardware, Standard I/O Interfaces:SCSI.		
Unit V:	**Arithmetic**	**Hours: 7**
Number Representations, Design of Fast Adders, Signed Addition and Subtraction, Multiplication of Positive Numbers ,Booth Multiplier, Fast Multiplication ,Integer Division, Floating Point Numbers and Operations.		

Unit VI:	Parallel Organization and Pipelining	Hours: 7
Parallel Processing, Array Processors, The Structure of General Purpose Multiple Processors Symmetric, Multiprocessors, Multithreading and Chip Multiprocessors, Clusters, Multicore Organization, Memory Organization in Multiprocessors. Pipelining: Basic concepts of pipelining throughput and speedup, pipeline hazards		
Text Books:	[1] Carl Hamacher, Zvonko Vranesic and Safwat Zaky, ―Computer Organization‖, Fifth Edition, Tata McGraw-Hill.	
Reference Books:	[1] William Stallings, ―Computer Organization and Architecture: Designing for Performance‖, Eighth Edition, Pearson. [2] John P. Hayes, ―Computer Architecture and Organization‖, McGraw Hill Publication. [3] DA Patterson and JLHennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2nd edition [4] A.S. Tanenbaum, "Structured Computer Organization", PHI Publication.	
Evaluation: Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) (Suggested)		

Cognitive Technology

5KS04	**Cognitive Technology**	**L-3, T-0, C-3**
Course Prerequisite:		
Objectives:	1. To study the basic concepts and approaches in the field of cognitive science 2. To apply the concepts of planning, reasoning and learning models in cognitive applications 3. To analyze language and semantic models of cognitive process.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Students will be able to understand the basic concept of cognitive science 2. Learn and understand the learning model and apply the same to appropriate real world applications 3. Apply reasoning methodology to real world applications 4. Students will understand and apply declarative and logic models 5. Envisage the concept of cognitive learning 6. Acquire knowledge in language processing and understanding	
Unit I:	**Introduction to Cognitive Science**	**Hours: 7**
Fundamental Concepts of cognitive science – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge representation, semantic networks, frames, conceptual dependency, scripts, Ontology-Understanding Common Sense Reasoning.		
Unit II:	**Planning and Learning Methods**	**Hours: 7**
Planning – Situation Logic- Learning in Cognitive Systems- Rote Learning – Learning by Examples - Incremental Concept Learning – Inductive Learning - Classification Techniques – Statistical Reasoning- Bayesian Classification- Bayesian Networks- Concept Learning- Version Spaces - Discrimination Trees.		
Unit III:	**Reasoning methods**	**Hours: 8**
Reasoning by analogy – Explanation based reasoning – Case based reasoning- Constraint Satisfaction- Constraint Propagation- Temporal reasoning – Temporal Constraint Networks- Spatial reasoning- Visual Spatial reasoning- Meta reasoning – Learning by correcting mistakes- AI ethics		
Unit IV:	**Cognitive Modeling**	**Hours:6**
Declarative/ logic-based computational cognitive modelling - connectionist models of cognition - Bayesian models of cognition - Cognitive Models of Memory and Language - Computational models of episodic and semantic memory - modelling psycholinguistics (with emphasis on lexical semantics) - towards deep understanding - modelling the interaction of language, memory and learning.		
Unit V:	**Cognitive Development**	**Hours: 7**
Modelling Select Aspects of Cognition Classical models of rationality - symbolic reasoning and decision making under uncertainty - Formal models of inductive generalization causality - Categorization and similarity analysis.		

Unit VI:	Language and Semantic Processing:	Hours: 7
Knowledge Acquisition – Semantics in Cognitive Science – Meaning and Entailment – Cognitive and Computational Models of Semantic Processing – Information Processing Models of the Mind- Physical symbol systems and language of thought- Applying the Symbolic Paradigm- Neural networks and distributed information processing- Neural network models of Cognitive Processes- Dynamical systems and situated cognition		
Text Books:	1. José Luis Bermúdez, ―Cognitive Science: An Introduction to the Science of the Mind‖, Cambridge University Press, New York, 2014. 2. Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing‖, IGI Global Publishers, 2019. 3. Elaine Rich, Kevin Knight, Shivashankar B. Nair, ―Artificial Intelligence‖, Third Edition, Tata McGraw-Hill Education, 2012.	
Reference Books:	1. Stuart J. Russell, Peter Norvig, ―Artificial Intelligence - A Modern Approach‖, Third Edition, Pearson Publishers, 2015. 2. Paul Miller, ―An Introductory Course in Computational Neuroscience‖, MIT Press, 2018. 3. Jerome R. Busemeyer, Zheng Wang, James T. Townsend, Ami Eidels(Ed), ―The Oxford Handbook of Computational and Mathematical Psychology‖,Oxford University Press (2015). 4. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, ―Cognitive Science: An Introduction‖, Second Edition, MIT press,1995.	
Evaluation: Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) (Suggested)		

Proposed Syllabus for Data Science and Statistics

5KS04	Data Science and Statistics	(L-3, T-0, C-3)
Course Prerequisite:	Discrete Structures & Graph Theory	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Data Science and Statistics by being able to do each of the following: 1. To understand the need of data science and Statistics 2. To understand the computational statistics in data science. 3. To understand and apply the different data modeling strategies. 4. To learn data analytics using python programming. 5. To be conversant with advances in analytics. 6. To apply principles of Data Science to the analysis of business problems.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Explain basics and need of data science 2. Demonstrate proficiency with statistical analysis of data. 3. Perform linear and multiple linear regression analysis. 4. Develop the ability to build and assess classification-based models 5. Evaluate outcomes and make decisions based on data. 6. Compare machine learning techniques to solve data science business problems	
Unit I:	**Introduction to Data Science**	**Hours: 6**
Basics and need of data science, Applications of data science, Exploratory Data Analysis, the Data Science Process, Stages of a Data Science Project, Data Science life cycle, Data: Data types, Data Collection, Need of data wrangling, Methods: Data Cleaning, Data Integration, Data reduction, Data transformation, data discretization.		
Unit II:	**Statistical Inference**	**Hours: 6**
Need of Statistics in Data Science, Measures of central tendency: Mean, Median, Mode, Mid-range. Measures of Dispersion: Range, variance, Mean deviation, standard deviation, Bays theorem Basics and need of hypothesis and hypothesis testing, Pearson correlation, sample hypothesis testing, chi-square tests, t-test.		
Unit III:	**Regression and its techniques**	**Hours: 6**
Basics of regression, simple and multiple regression, Ridge regression, Lasso regression, Selecting the Tuning Parameter, Tradeoff Between Prediction Accuracy and Model Interpretability,		
Unit IV:	**Classification**	**Hours: 6**
Classification: An Overview of Classification, why not Linear Regression? Naïve based decision trees, Regression vs Classification Problems, Logical Regression: The Logistic Model, Regression Coefficients, Making Predictions, Multiple Logistic Regression, Classification Problems, The Bootstrap		
Unit V:	**Tree Based Methods**	**Hours: 6**

Tree-Based Methods: Decision, Regression and Classification Trees, Trees Versus Linear Models, Advantages and Disadvantages, Bagging, Random Forests, Boosting, Generalized Additive Models: Regression Problems and Classification Problems.

Versus Linear Models, Advantages and Disadvantages, Bagging, Random Forests, Boosting

Unit VI:	Supervised and Unsupervised Learning	Hours: 6

Supervised learning methods overview, challenges, random forest algorithm, Unsupervised Learning: The Challenge of Unsupervised Learning: Principal Components Analysis, Clustering Methods: K-Means Clustering, Hierarchical Clustering, Practical Issues in Clustering.

Text Books:

Chirag Shah," A Hands-on Introduction to Data Science ", Cambridge University Press (2020) ISBN:978-1-108-47244-9.

Reference Books:

1. [1] Cathy O'Neil and Rachel Schutt: Doing Data Science, First Edition, 2014, O'reilly Publications, ISBN:978-1-449-35865-5.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: An Introduction to Statistical Learning with Applications in R, First Edition, 2013, Springer-Verlag New York, ISBN: 978-1- 4614-7137-0.

Evaluation:

Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) **(Suggested)**

INTERNET OF THINGS

Subject Code 5KS04	INTERNET OF THINGS	**L-3, T-0, C-0**
Course Prerequisite:	Participants will be expected to have a good background in Internet.	
Course Objectives:		
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to:	
Unit I:		**Hours: 6**
Introduction to Internet of Things, Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabled Technologies like Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels & Deployment Templates, Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle		
Unit II:		**Hours: 7**
IOT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software defined networks, network function virtualization, IoT Systems Management, Simple Network Management Protocol (SNMP) ,Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER.		
Unit III:		**Hours: 7**
IoT Platforms Design Methodology, Case Study on IoT System for Weather Monitoring, Motivation for Using Python, IoT Systems - Logical Design using Python ,Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling l, Date/Time Operations, Classes, Python Packages of Interest for IoT		
Unit IV:		**Hours: 7**
IoT Physical Devices & Endpoints, Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces serial, SPI, I2C, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, Interfacing an LED and switch with Raspberry Pi, Interfacing Light Sensor with Raspberry Pi Other IoT Devices, pcDuino, BeagleBone Black, Cubieboard.		
Unit V:		**Hours: 7**
IoT Physical Servers & Cloud Offerings, Introduction to Cloud Storage Models & Communication APIs , WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework - Django , Designing a RESTful Web API , Amazon Web Services for ,SkyNet IoT Messaging Platform		
Unit VI:		**Hours: 7**
Case Studies Illustrating IoT Design, Introduction, Home Automation: Smart Lighting, Home Intrusion detection, Cities: Smart parking, Environment: Weather Monitoring System, Weather reporting Bot, Air pollution monitoring, Forest fire detection, Agriculture: Smart Irrigation, Productivity Applications: IoT printer.		

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, –Internet of Things – A hands-on approach‖, Universities Press, ISBN:0: 0996025510, 13: 978-0996025515.

Reference Books:

1. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012.
2. David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, ISBN-13: 978-1-58714-456-1, ISBN-10: 1-58714-456-5, 2017
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, –From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014

"Introduction to Cyber Security"

Subject Code 5KS04	Introduction to Cyber Security	L-3, T-0, C-0
Course Prerequisite:	Participants will be expected to have a good background in Cyber Security.	
Course Objectives:	1. Understand basics of Cyber Security. 2. To be able to secure a message over network. 3. To understand overall network working mechanism for secure data flow. 4. To understand network security protocols and attack prevention.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to: 1. Understanding the basics concepts of Cyber Security 2. Discussing the concepts of cryptography and its implementation in secure network data flow. 3. Provide security of the data over the network. 4. A good knowledge of some commonly used cryptographic primitives and protocols.	
Unit I:		**Hours: 6**
Introduction to Information Security, Data and Network Security, Cryptographic Techniques, Computer-based Symmetric and Asymmetric Key, Need for Security, Security Attacks, Services and Mechanisms, Network Security, Model		
Unit II:		**Hours: 7**
Cryptographic Techniques, Cryptographic Algorithms: Substitution &Transposition Techniques, Block Cipher, Stream Ciphers, RC4, DES, AES, Triple DES, Digital Signature – Properties of Digital Signature, Public Key Protocol; Certificates; Certificate Authorities, Internet Security Protocols.		
Unit III:		**Hours: 7**
Authentication: Requirements, Message Authentication Codes, Algorithms: Hashes, MD5 & SHA, Authentication Techniques: JSON web token (JWT), Password, Certificate based & Biometric Authentication, Kerberos, Authentication Services: Auth0, Identity Server		
Unit IV:		**Hours: 7**
Introduction: Virtual Private Network (VPN), Virtual Private Cloud (VPC), Subnet, VPC Routing, Private & public VPN, Domain Name System (DNS), Firewalls, Internet gateways, VPC endpoints, VPC peering, Security: Secure Socket Layer (SSL), Transport Layer Security (TLS), Web Security Requirements, Secure Electronic Transaction (SET)		
Unit V:		**Hours: 7**
Network Threads, Security Control Mechanisms: Encryption, Content Integrity (Hash Technique), Authentication (JWT bearer token), Access Controls, Data Flow Security, Firewall: Types of Firewalls, Personal Firewalls, Advantages & disadvantages, Intruders, Viruses and related threats. Intrusion Detection Systems, Denial of service attacks.		
Unit VI:		**Hours: 7**
Defining Intrusion, Intrusion Detection, Strategies for Intrusion Detection, Vulnerability		

Analysis, Credentialed approaches, Planning Security Policies; Risk Analysis; Security Policies for an Organization; External Security. Intrusion Detection Systems, Response, Scanning, Threat Management.

Text Books:

2. William Stallings, –Cryptography & Network Security‖, PHI.
3. Forouzan, –Cryptography & Network Security‖, PHI 4.
4. Cryptography And Network Security Principles and Practice Fourth Edition, William Stallings, Pearson Education
5. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR
6. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
7. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.

Reference Books:

4. Cryptography And Network Security, Principles and Practice Sixth Edition, William Stallings, Pearson
5. Information Security Principles and Practice By Mark Stamp, Willy India Edition
6. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
7. Cryptography and Network Security Atul Kahate, TMH
8. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India
9. Information Systems Security, Godbole, Wiley-India
10. Information Security Principles and Practice, Deven Shah, Wiley-India
11. Security in Computing by Pfleeger and Pfleeger, PHI
12. Build Your Own Security Lab : A Field Guide for network testing, Michael Gregg, Wiley India

Principles of e-Marketing for Engineering

5KS05	Principles of e-Marketing for Engineering	L-3, T-0, C-3
Course Prerequisite:		
Objectives:	6. To provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success; 7. To develop a digital marketing plan; to make SWOT analysis; 8. To define a target group; to introduced to various digital channels, their advantages and ways of integration; 9. To integrate different digital media and create marketing content to manage a digital marketing performance efficiently.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 6. To identify the importance of the digital marketing for marketing success, 7. To manage customer relationships across all digital channels and build better customer relationships, 8. To create a digital marketing plan, starting from the SWOT analysis and defining a target group, 9. To identifying digital channels, their advantages and limitations, to perceiving ways of their integration taking into consideration the available budget	
Unit I:	**Introduction to e-Marketing:**	**Hours: 7**
Introduction, Wired-up world, B2C, B2B, C2B and C2C Model, Objectives: Sell, Serve, Speak, Save, Sizzle, Introduction to e-strategy		
Unit II:	**Remix and e-Models**	**Hours: 7**
Introduction to Remix: Product, Price, Place, Promotion, People, Process. Introduction to e-Models, e-Marketplace, Digital Communication market, Web & Social Network Models, Customer buying models, Loyalty models		
Unit III:	**e-Customers**	**Hours: 7**
Introduction to e-Customers, Motivations, Expectations, Fears & Phobias, Online Buying Process, information processing, relationship & royalty, Communities & socia l networks Customer profiles		
Unit IV:	**e-Tools & Site Design**	**Hours:7**
Introduction to e-Tools, Technology development & customer impact, Interactive digital TV, Digital Radio, Mobile Devices, Interactive self-service kiosks, Convergence, Integrated Campaigns, Web-site design, Integrated design, online value proposition, Dynamic & aesthetics design		
Unit V:	**Traffic Building**	**Hours: 7**
Search Engine Marketing, Online PR & Partnerships, Interactive Advertising, e-mail & viral marketing, Online traffic building, Control, Resourcing		

Unit VI:	e-CRM & e-Business	Hours: 7
Introduction to e-CRM, Database marketing, e-CRM, Profiling, Personalization, Introduction to e-Business, e-Business Architecture & framework, e-business security.		
Text Books:	[1] E-Marketing excellence: Planning & Optimizing your Digital Marketing, Dave Chaffey & P R Smith, 3rd Edition, Butterworth-Heinemann, Elsevier.	
Reference Books:	[1] Marketing 4.0: Moving from Traditional to Digital, Philip Kotler, H. Kartajaya, I. Setiawan, Wiley. [2] Business Marketing and Management Principles for IT and Engineering, D. N. Chorafas, CRC Press. [3] Marketing Management, Philip Kotler, Kevin Keller, 12th Edition, Pearson Prentice Hall. [4] Marketing Insights from A to Z, Philip Kotler, John Wiley & Sons. .	
Evaluation: Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) (Suggested)		

Fundamentals of Finance & Accounting

5KS05	**Fundamentals of Finance & Accounting**	**L-3, T-0, C-3**
Course Prerequisite:		
Objectives:	Students will be expected to demonstrate their understanding of the following: 10. Know and apply accounting and finance theory 11. Critically evaluate financial statement information 12. Evaluate and compare different investments	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 11. Define bookkeeping and accounting 12. Explain the general purposes and functions of accounting 13. Explain the differences between management and financial accounting 14. Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses 15. Identify the main financial statements and their purposes.	
Unit I:	**The basics of Accounting I**	**Hours: 7**
The Assets, Liabilities and Balance Sheets, Procedure for creating a Balance Sheet, Different forms of Balance Sheet, Basic concepts of Accounting		
Unit II:	**The basics of Accounting II**	**Hours: 7**
The Profit & Loss Account, Cash Flow Statement, Creating Profit & Loss Account, Creating Cash Flow Statement, Book Keeping Basic terminology, Debt & Credit Convention		
Unit III:	**Interpretation of Accounts**	**Hours: 8**
Accounting Rules, Reports, Assets, Liabilities, Shareholders' Equity, P&L Statement,		
Unit IV:	**Introduction to Financial Management**	**Hours:6**
What is Finance, Forms of Business Organization, Stock Price & Shareholder Value, Intrinsic Value, Stock Price, Business trends and ethics, Conflicts management.		
Unit V:	**Financial Markets and Institutions**	**Hours: 7**
Financial Markets, Capital Allocation, Financial Institutions, Stock Market, Market for Common Stock, Stock Market Returns, Stock Market Efficiency		

Unit VI:	Financial Statements & Analysis	Hours: 7
Financial Statements & Reports, Stockholders' Equity, Free Cash Flow, Income Taxes Analysis of Financial Statements: Ratio Analysis, Liquidity Ratios, Asset & Debt Management Ratio, Profitability Ratio, Trend Analysis		
Text Books:	1. Accounts Demystified, 5th Edition, Anthony Rice, Pearson – Prentice Hall 2. Fundamentals of Financial Management, 6th Edition, E. F. Brigham, J.F. Houston, Cengage Learning.	
Reference Books:	1. Engineering Economics: Financial Decision Making for Engineering, N. M. Fraser, E. M. Jewkes, 5th Edition, Pearson Publication. 2. Financial Fundamentals for Engineers, Richard Hill & George Slot, Butterworth-Heinemann, Elsevier. 3. Financial Accounting, Jerry Weygandt, Paul Kimmel, Donald Kieso, 9th Edition, Wiley 4. Financial Accounting: Tools for Business Decision Making, Jerry Weygandt, Paul Kimmel, Donald Kieso, 6th Edition, Wiley Plus.	
Evaluation: Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) (Suggested)		

Entrepreneurship

5KS05	**Entrepreneurship**	L-3, T-0, C-3
Course Prerequisite:		
Objectives:	13. To explore and experience the joy of creating unique solutions to market opportunities 14. To create and exploit innovative business ideas and market opportunities 15. To turn market opportunities into a business plan 16. To build a mindset focusing on developing novel and unique approaches to market opportunities	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 16. Develop awareness about entrepreneurship and successful entrepreneurs. 17. Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication. 18. Understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective	
Unit I:	**Spirit of Entrepreneurship**	**Hours: 7**
Entrepreneurship **process, ecosystem, Economic relevance of** Entrepreneurship, Societal & Personal Entrepreneurship Ecosystem, The Entrepreneurship Mind, Success factors to be an Entrepreneurship, Components of an Entrepreneurial Mind-set, Innovation, Innovation and Imitation, Entrepreneurs in Innovation Process, Commercialization of Innovations.		
Unit II:	**Entrepreneurship Reconsidered**	**Hours: 7**
Importance of Team and Special role of the CEO, Team Building, Collaboration, Cooperation Networking, Diagnosing the Internal Capabilities, analysis, Understanding - the Market & Custome access, Industry dynamics & competitive environment, Classical Competitive analysis.		
Unit III:	**Building a New Business**	**Hours: 8**
Exploring the Innovation Funnel, Generation & Pre-Field Assessment of the Business Idea, Important Components of Concepts, Sales function in Business Building Process, The New Business Model.		
Unit IV:	**Entrepreneurial Strategies**	**Hours:6**
Strategic Thrust of the Entrepreneurial Company, Entrepreneurial Perspective, OSA Process, Key Performance Indicators, Market Segmentation, Strategic Options for Entrepreneurs – Entrepreneurial, Complementary and Competitive, Customer Understanding, Developing the Entrepreneurial Strategy.		
Unit V:	**Formulating the Business Plan**	**Hours: 7**
Pre-Field Work to the Business Plan, Business Plan as Road Map & Key Document, Contents of Business Plan, Projected Economics, Risk Management, Identification & Evaluation of Risk, Risk Controlling, Lesson Learned and Recommendations for Entrepreneurs.		

Unit VI:	Entrepreneurial Growth	Hours: 7
Making transition from start-up to growth, A model of driving forces, Growth Process, Opportunity Domain. Social Entrepreneurship – Overview, New form of Organization, Identifying Opportunity Forming Organization, Securing Resources, Going to Scale.		
Text Books:	**1. Entrepreneurship for Engineers,** Helmut Kohlert, Dawud Fadai & Hans-Ulrich Sachs, 2nd Editiion, Oldenbourg Verlag Munchen **2. Entrepreneurship,** William Bygrave, Andrew Zacharakis, 2nd Edition, John Wiley & Sons, Inc.	
Reference Books:	1. **Entrepreneurship for Engineers,** Kenji Uchino, Taylor & Francis Group, CRC Press. 2. **Entrepreneurship: Theory, Process, Practice,** Howard Frederick, Allan O'Connor, Donald Kuratko, 4th Edition, Cengage Learning. 3. **Entrepreneurship: Owing Your Future,** Steve Mariotti, 11th Edition, Prentice Hall.	
Evaluation: Continuous Assessment (30 %), Assignments/Quizzes/Projects (20%), Term End Examination (50%) (Suggested)		

5KS06 Database Management Systems Lab

Course Code: 5KS06	Course Title: **Database Management Systems Lab**	LTPC: P-2, C-1
Course Prerequisite:	Basic concept of programming, Basic concepts of data structures	
Course Objectives:	1. To study the ER model which provides a high level view of the issues in database design, to capture the semantics of realistic applications within the constraints of a data model. 2. To study the primary data model (relational model) for commercial data processing applications. 3. To study the standard structured query language and retrieve the information from the database in various ways. 4. To study the integrity and security constraints of the database by enforcing constraints.	
Course Outcomes(Expected Outcome):	1. To design ER model for any kind of application. 2. To design and develop database. 3. To apply normalization. 4. To query the database. 5. To apply various integrity constraints 6. To build indices, views 7. To implement triggers, assertions	

List of Experiments : Preferably 25 Experiments out of 25 20 may be based on syllabi and at least 05 should be beyond syllabi based on learning of syllabi (Apply)

1. **Practical 1: To Study a Database Modeling Tool.**

Study of Data Modeling Tools

- Take a description of the enterprise, create its corresponding ER Diagram and build a database model using any modeling tool. The following basic features of the modeling should be covered while building the model:
  - Logical / Physical Modeling
  - Adding an entity / its attributes , relationships (all kinds of relationships viz., parent-child, foreign key references, one to many, many to many etc)
  - Forward / reverse engineering
  - Details of forward engineering / schema generation
  - Steps to generate the schema

2. **Practical 2: To Study and implement DDL Commands**
   Implement the model created in Practical 1, in any of the DBMS like Oracle, MySQL, or Microsoft SQL Server database software.
   - Creating the proper tables
   - Insert the data into it.
   - Study Dropping and Altering the Tables. Study the cascaded deletes.

3. **Practical 3: To Study and implement DML Commands-I**
   - SQL queries : Write and execute different SQL queries
   - Execute Simple queries using SELECT, FROM, WHERE clauses,
   - In Where clause use different predicates involving OR,AND, NOT
   - Rename operation
   - Tuple Variables

- Write SQL for various String operations (%,_,*)
    - Match beginning with
    - Match ending with
    - Substring
    - Match exactly n characters
    - Match at least n characters
- Sort the output of the query using **Order by**
- Write SQL using **Having**

4. **Practical 4** : **To Study and implement DML Commands-II**

   Write SQL queries and perform

    - Set membership operations
    - In, not in
    - Some
    - All
    - Exists and not exists, Test for emptyness using exists, not exists
    - Test for absence of duplicates.
    - Nested queries

5. **Practical 5.** Study and implement aggregation functions.

   Write different queries using following Aggregate functions

    a. Min (minimum 3 SQL queries)
    b. Max (minimum 3 SQL queries)
    c. Avg (minimum 3 SQL queries)
    d. Sum (minimum 3 SQL queries)
    e. Count (minimum 3 SQL queries)

6. **Practical 6: Write SQL to create Views and Indexes**.
7. **Practical 7: Write SQL to perform the modifications to the database**
8. **Practical 8 : PL /SQL**
9. **Practical 9 : Database Access Using Cursors**
   Write a trigger to find the names and cities of customers who have more than xyz in any account.
10. **Practical 10 : Triggers**
    - Write a trigger for dealing with the overdrafts (set the account balance to zero, and creating a loan in the amount of the overdraft. Keep account number as loan number in the loan table)
    - Write a trigger for dealing with blank cities (set the city field to null when it is blank)
11. **Practical 11: Procedures, functions**
    - Write atleast 2 functions, and demonstrate its use
    - Write atleast 2 procedures, and demonstrate its use
12. **Practical 12 : Web Programming with PL/SQL. (Contents Beyond Syllabus)**
    HTTP, A Simple Example., Printing HTML Tables., Passing Parameters., Processing HTML Forms., Multi-Valued Parameters.
13. **Practical 13: Develop a JDBC Applications, Retrieve the information by connecting to the database using a host language (JAVA, C, C++) (Contents Beyond Syllabus)**
14. **Practical 14: Web Programming with Java Servlets. (Connecting to the database) (Contents Beyond Syllabus)**
    A Simple Servlet., HTTP Servlet API Basics.,HTML Form Processing in Servlets.
15. **Practical 15: PHP : Develop a simple application to access the database using PHP**

(Contents Beyond Syllabus)

16. Study of Open Source NoSQL Databases
17. **Based on the concepts covered in text create a Mini Project:**

Suggested Topics

i. Bank database (Given in Korth book)
ii. University Database (Given in Korth book)
iii. Airline Flight Information System.
iv. Library Database Application.
v. University Student Database.
vi. Video Chain Database.
vii. Banking Database.
viii. BiBTeX Database.
ix. Music Store Database.
x. Online Auctions Database.
xi. A Web Survey Management System.

Text Book: Korth, Sudarshan, Silberschatz, Database System Concept, Mc-Graw Hill
Mysql Reference Manual (for Mysql database)

Reference Books: may be 5 to 6

1. Kevin Roebuck, –Storing and Managing Big Data - NoSQL, HADOOP and More‖, Emereopty Limited, ISBN: 1743045743, 9781743045749
2. Kristina Chodorow, Michael Dirolf, –MangoDB: The Definitive Guide‖ ,O"Reilly Publications, ISBN: 978-1-449-34468-9.
3. Adam Fowler, –NoSQL For Dummies‖, John Wiley & Sons, ISBN-1118905628
4. C J Date, –An Introduction to Database Systems‖, Addison-Wesley, ISBN: 0201144719

Evaluation: Continuous Assessment (50 %) Term End Examination (50%)-suggested

5KS07 Proposed Syllabus for Compiler Design – Lab

5KS07	Compiler Design – Lab	Practical – 02 Hour/Week Credit – 01
Course Prerequisite:	Basic knowledge of C Programming, Data Structures, Theory of Computation.	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Compiler Design by being able to do each of the following: 1. Know the basic components of a Compiler. 2. To implement Lexical Analyzer using Lex tool and Syntax Analyzer using Yaac Tool. 3. To implement various parsing methods. 4. To implement code optimization techniques .	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Identify the fundamentals of compiler and its phases. 2. Use the powerful compiler generation tools such as Lex and Yacc. 3. Write a lexical scanner, either from scratch or using Lex. 4. Develop program for solving parser problems. 5. Examine the various optimization techniques.	
List of Experiments:	Preferably **25** Experiments. **20** may be based on syllabi and at least **05** should be beyond syllabi, based on learning of syllabi (Apply)	

List of Experiments based on Syllabus: (Maximum 20)

[1] Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
[2] Write a C program to identify whether a given line is a comment or not.
[3] Implement a C program to check parenthesis of regular expression is balanced or not.
[4] Implement a C program to construct NFA from regular expression.
[5] Implement a C program to simulate Deterministic Finite Automation (DFA) for a string which ending with _a‘, _a*b+‘, _abb‘.
[6] Write a C program to construct of DFA from NFA.
[7] Implement a Lex program to verify the parenthesis of a given expression is balanced.
[8] Implement a Lex program to recognize the token like Digit, Identifier & Delimiter.
[9] Implement the Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
[10] Implement a Lex program to a valid arithmetic expression and to recognize the identifier and operators present.
[11] Implement a Lex program to count words, characters, lines, vowels and consonants from given input.
[12] Implement a Lex program to check given number is positive negative or zero.
[13] Implement a Lex program to generate string which is ending with zeros.
[14] Implement LEX and Yacc tool to implement desk calculator.
[15] Write a C program for constructing of SLR parsing.
[16] Write a C program for constructing of LL (1) parsing.
[17] Write a C program for constructing of LALR parsing.
[18] Write a C program for constructing recursive descent parsing.
[19] Write a C program to implement Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.
[20] Write a C program for Tokenizing the file which reads a source code in C/C++ from an unformatted

file and extract various types of tokens from it
[21] Write functions to find FIRST and FOLLOW of all the variables / given grammar.
[22] Implement a Shift Reduce Parser for the following productions.
E → E+E / E*E / a / b
[23] Implement a symbol table containing functions create(), modify(), search(), display() and delete().
[24] Implement three address Code for the input a=b*c.
[25] Implement Recursive Decent Parser for the given productions.

List of Experiments beyond Syllabus: (Maximum 05)

[1] Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
[2] Write a C program to generate machine code from abstract syntax tree generated by the parser.
[3] Write a Lex program to find out total number of vowels, and consonants from the given input string.
[4] Implementation of Finite State machines DFA, NFAs .
[5] Computation of Leading & Trailing Sets.

Text Books:

[1] Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman Compilers: ‒Principles, Techniques and Tools‖, Pearson Education, Second Edition.

Reference Books:

[1] Doug Brown, John Levine, and Tony Mason, ‒Lex & Yacc‖, O'Reilly & Associates, Inc., Second Edition.
[2] Andrew Appel, ‒Modern Compiler Implementation in C‖, Cambridge University press.
[3] K C. Louden ‒Compiler Construction - Principles and Practice‖ India Edition, CENGAGE.
[4] Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs and Koen Langendoen, ‒Modern Compiler Design‖, Second Edition, John Wiley & Sons Publication.
[5] Keith Cooper and Linda Torczon, ‒Engineering: A Compiler‖, Second Edition, Morgan Kaufmann Publication.

Evaluation:

Continuous Assessment (50 %), Term End Examination (50%) **(Suggested)**