SCHEME FOR EXAMINATION

B. TECH (FOUR YEAR) DEGREE
COURSE COMPUTER SCIENCE AND ENGG
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
THIRD YEAR, SEMESTER - V
W.E.F. SESSION 2022-23

Branch: - Computer Science & Engg. **Year: III** **Sem- V**

S. No.	Code no.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1	CS205TES05	Microprocessor and Interfaces	3	0	0	30	70	100	3
2	CS205TPC08	Relational Database Management System	3	0	0	30	70	100	3
3	CS205TPC09	Formal Language and Automata Theory	3	0	0	30	70	100	3
4	CS205TPC10	Parallel Computing	3	0	0	30	70	100	3
5	CS205TPEX	Professional Elective-I	3	0	0	30	70	100	3
	PRACTICAL								
1	CS205PPC05	Relational Database Management System Lab	0	0	3	30	20	50	1.5
2	CS205PPC06	Parallel Computing Lab	0	0	3	30	20	50	1.5
3	CS205PPR01	Minor Project- I	0	0	3	30	20	50	1.5
		Total							**19.5**

Professional Elective-I Subject V Sem.			
S. No.	**Subject Code**	**Subject**	**Credits**
1	CS205TPE01	Software Engineering	3
2	CS205TPE02	Information Theory & coding	3
3	CS205TPE03	Mobile Communication	3
4	CS205TPE04	Multimedia System Design	3

SCHEME FOR EXAMINATION

B. TECH (FOUR YEAR) DEGREE
COURSE COMPUTER SCIENCE AND ENGG
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
THIRD YEAR, SEMESTER - VI
W.E.F. SESSION 2022-23

S.No.	Code no.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1	CS206TPC11	Design and Analysis of Algorithms	3	0	0	30	70	100	3
2	CS206TPC12	Java	3	0	0	30	70	100	3
3	CS206TPC13	Digital Image Processing	3	0	0	30	70	100	3
4	CS206TPEX	Professional Elective-I	3	0	0	30	70	100	3
5	CS206TPEX	Professional Elective-II	3	0	0	30	70	100	3
6	CS206TOEX	Open Elective-I	3	0	0	30	70	100	3
	PRACTICAL								
1	CS206PPC07	Design and Analysis of Algorithms Lab	0	0	3	30	20	50	1.5
2	CS206PPC08	Java Lab	0	0	3	30	20	50	1.5
3	CS206PPR02	Minor Project-II	0	0	3	30	20	50	1.5
		Total							**22.5**

W.E.F. SESSION 2022-23

Branch: - Computer Science & Engg. Year: III Sem- VI

Professional Elective-I & II Subject VI Sem.				**Open Elective-I Subject VI Sem.**			
S. No	**Subject Code**	**Subject**	**Credit**	**S. No.**	**Subject Code**	**Subject**	**Credit**
1	CS206TPE05	Management Information System	3	1	CH206TOE01	Industrial utilities andsafety	3
2	CS206TPE06	Robotics	3	2	CE206TOE01	Metro systems andEngineering	3
3	CS206TPE07	Artificial Intelligence	3	3	CS206TOE01	Object Oriented Programming with C++	3
4	CS206TPE08	Software Testing and Quality Assurance	3	4	EC206TOE01	Introduction to Electronics and Circuits	3
				5.	IP206TOE01	Operation Research	3
				6.	IT206TOE01	Computer Graphics	3
				7.	ME206TOE01	Automobile Engineering	3

Sub Title: MICROPROCESSOR AND INTERFACES		
Sub Code: CS205TES05	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To describe the basic architecture of 8086.
- To discuss the Instruction set of 8086.
- Evaluate the different technique of interfacing with memory and IO devices.
- Develop knowledge about interfacing devices and peripheral devices.
- To describe the basic architecture of 80386 and co-processor.

UNIT No	Syllabus Content	No of Hours
1	Microprocessor Architecture -8086, Register organization of 8086, Signa descriptions of 8086 chip, Physical Memory organization, Introduction to Maximum and Minimum mode operation, Processor 8088. .	**8**
2	Instruction formats, addressing modes, Instruction Set of 8086: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Shift and rotate instructions, String Manipulation instructions, Machine Control Instruction, Flag Manipulation Instruction, Assembler Directive and Operators Programming with an Assembler, Programming examples.	**7**
3	Introduction to Stack, Stack Structure of 8086, Interrupt, Interrupt and Interrupt Service Routines, Non Maskable Interrupt, Maskable Interrupt. Subroutine MACROS: Defining a MACRO, Passing Parameters to MACRO.	**7**
4	Memory Interfacing, Interfacing I/O Ports, Programmable Interval Timer 8253: Architecture and Signal Description, Operating modes, Programming and Interfacing 8253, DMA Controller 8257: Architecture and Signal Description, Keyboard/Display Controller 8279: Architecture and Signal Description, Mode of Operation, Floppy Disk Controller 8272: Architecture and Signal Description, Commands.	**7**
5	Multi microprocessor System: Numeric Processor 8087, IO Processor 8089. 80386 Features, Architecture and Signal Description, Register Organization, Real Mode Protected Mode, Virtual Mode, Paging, Segmentation.	**7**

COURSE OUTCOMES: The students would have learnt

CO1. Learn about the basic architecture of 8086.
CO2. Develop a skill to do assembly language programming.
CO3. Learn to do interfacing with memory & IO devices.
CO4. Develop a understanding about the peripheral devices.
CO5. Learn about the basic of 80386 microprocessor & co-processor.

Text Books:

1. Advanced Microprocessors and Peripherals – Architecture, Processing and Interfacing : A.K. Ray, K.M. Bhurchandi
2. Microcomputer System 8086/8088 Family – Architecture Programming and design: Y Liu and G. A. Gibson: Prentice Hall
3. 80386 Microprocessor Handbook C.H. Pappas and W. H. Murray: Osborne McGraw Hill

Reference Books:

1. Microprocessor Architecture Programming and Application: R.C. Gaonkar: Wiley Eastern.
2. Microprocessor 8086, 80386 & Pentium, Barry B. Brey

Sub Title: Relational Data Base Management System		
Sub Code: CS205TPC08	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base 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, relationships of higher degree.	8
2	**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 to SQL: Characteristics of SQL. Advantage of SQL. SQL data types 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 in SQL.	7
3	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	7
4	**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, checkpoints, deadlock handling.	7

5	**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation-based protocol, multiple granularities, Multi version schemes, Recovery with concurrent transaction.	7

COURSE OUTCOMES: The students would have learnt

- CO1. Explain the features of database management system and relational database
- CO2. Design conceptual models of a database using E-R modeling for real life applications & construct queries in Relational Algebra
- CO3. Create & populate a RDBMS for a real-life application, with constraint & keys using SQL.
- CO4. Retrieve any type of information from a database by formulating complex queries in SQL
- CO5. Analyze the existing design of database schema & apply concept of normalization to design an optimal database.

Text Books:

1. Date C J, "An Introduction to Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley
4. Leon & Leon, "Database Management System", Vikas Publishing

Reference Books:

1. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
2. Majumdar & Bhattacharya, "Database Management System", TMH
3. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
4. Kroenke, "Database Processing: Fundamentals, Design and Implementation", Pearson Education.
5. Maheshwari Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi

Sub Title: FORMAL LANGUAGE AND AUTOMATA THEORY		
Sub Code: CS205TPC09	**No. of Credits: =3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines.
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators.
- To understand the relation between Contexts free Languages, PDA and TM.
- To learn how to design PDA as acceptor and TM as Calculators.
- To learn how to correlate Automata's with Programs and Functions.

UNIT No	Syllabus Content	No of Hours
1	**Finite Automata & Regular Expression:** Deterministic and Non-deterministic Finite automata, Regular Expression, two-way finite automata, Finite automata with output, Properties of regular set, Pumping lemma, Closure properties.	8
2	**Context Free Grammars (CFG):** Introduction of CFG, Derivation trees, Simplification of normal forms, CNF, GNF, Regular Grammars, UnrestrictedGrammars and Relations between Classes of languages.	7
3	**Push Down Automata:** Introduction of PDA, Definitions relationship between PDA and Context Free Languages, properties of CGL's, Decision Algorithms.	7
4	**Turing Machine:** The Turing machine model, Computable languages andfunctions, Modification of Turing machines, Church's Hypothesis	7
5	**Recursive and Recursive Enumerable Languages:** Properties of recursive and recursive enumerable languages Universal Turing machine, Undesirability Post correspondence problem, Introduction to Recursive function theory.	7

COURSE OUTCOMES: The students would have learnt

- CO1. Understand, design, construct, analyze & interpret Regular languages, Expressions and Grammers.
- CO2. Design different types of Finite Automata &machines as Acceptor, Verifier & Translator.
- CO3. Understand, design, analyze & interpret Context Free Languages, Expression & Grammers.
- CO4. Design different types of Push Down Automata as Simple Parser.
- CO5. Design different types of Turing machines as Acceptor, Verifier, Translator & basic Computing Machine.

Text Books:

1. Introduction to Automata Theory Languages and Computation, Hopcroft and Ullman, Narosa.
2. Theory of Computer Science, Mishra and Chandra shekharan, PHI.

Reference Books:

1. Theory of Computer Science, Kohan, John Wiley.
2. Theory of Computer Science, Korral
3. Introduction to Automata Theory Languages and Computation, Hopcroft and Ullman, Addison Wesley
4. Introduction to Languages & Theory of Computation, Martin, , TMH

Sub Title: PARALLEL COMPUTING		
Sub Code: CS205TPC10	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To introduce parallel, distributed and cloud computing, the major concept, ideas & various hardware model of parallel & distributed system.
- To study design the multiprocessor system by various interconnection network like static & dynamic etc.
- To study various technique for vector pipeline architecture design to achieve parallelism(concurrency).
- To study about advanced & more powerful processor technology.
- To study about parallel algorithm design, programming language & tools like Python, CUDA. To study about architecture design of GPU.

UNIT No	Syllabus Content	No of Hours
1	**Introduction Of Parallelism:** Introduction -parallelism in Uniprocessor systems, Principles of Scalable Performance, architectural classification schemes, SISD, SIMD, MISD, MIMD architectures, multiprocessor and multicomputer, UMA, NUMA, COMA, NORMA model Parallel algorithms: Various Sorting	8
2	**Parallel Models & Interconnection Network:** System Interconnect architecture – static, dynamic, multistage interconnection networks, design considerations throughputs, delay, blocking and non-blocking properties interconnected memory organization - C-Access, S-Access, C-S access.	7
3	**Pipeline & Vector Processing:** Principal of Pipelining - Over lapped parallelism, principal of Liner pipelining processor, General pipelining and reservation tables, arithmetic pipelining, Design of pipeline Instruction units, arithmetic pipelining design example, hazard detection and resolution, JOB sequencing and collision prevention, vector processing function organization of instructions in IBM 360/91.	7
4	**Advanced Processor and Parallelism:** Advanced processor technology – RISC & CISC computers, super scalar architecture, principles of multithreading, multithreaded architectures of MP systems. Context switching policies, shared variables, locks, semaphores, monitor, multitasking and Cray multiprocessor.	7

5	**Parallel Programming Design Coding and Debugging:** CPU parallelism, GPU parallelism-program, Exploiting parallelism in programmed multidimension -al arrays, directed acyclic graphs, distance and direction vectors, data flow computer and data flow graphs. Parallel algorithm structure, analyzing parallel algorithm. Elementary parallel algorithms, Programming: Parallel programming with Synchronous and Asynchronous, Various API of MPS, PYTHON, CUDA, OpenCL	7

COURSE OUTCOMES: The students would have learnt

CO1: Spontaneously able to design the multiprocessor system with various hardware electronics circuit like CU, ALU, RAM etc.
CO2: Design new interconnection network which connects the processors and other devices like input and output devices (I/O)
CO3: Spontaneously try and invented a new type of pipeline processor architecture in which throughput can be as better as possible than all other.
CO4: How do combine the techniques of parallelism to obtain a more power full architecture as a outcome.
CO5: Course outcomes are skills and abilities to make parallel algorithm and program to enhance the speed up of execution of process.

Text Books:

1. Computer Architecture & Parallel processing - Kai Hwang 7 Briggs. (MGH).
2. Advanced Computer Architecture with Parallel Programming", K. Hwang, MGH.
3. Quinn, Parallel computing – theory and practice, Tata McGraw Hill.
4. Sima and Fountain, Advanced Computer Architectures, Pearson Education
5. Ed. Afonso Ferreira and Jose' D. P. Rolin, Parallel Algorithms for irregular problems - State of the art, Kluwer Academic Publishers

Reference Books:

1. Parallel Computers: Arch.& Prog., Rajaraman & Siva Ram Murthy, PHI.
2. Parallel computing- Theory and practice - Michael J Quinn- Mc Graw Hill
3. Selim G. Akl, The Design and Analysis of Parallel Algorithms, PH International.

Sub Title: SOFTWARE ENGINEERING		
Sub Code: CS205TPE01	**No. of Credits :3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To discuss the fundamental concepts of Software Engineering.
- To discuss the Various Models of Software.
- Acquire skills and knowledge to advance their career, including continually upgrading professional, communication, analytic, and technical skills.
- To Learn the ability to work effectively as a team member and/or leader in an ever-changing professional environment
- Learn to develop a small Software.

UNIT No	Syllabus Content	No of Hours
1	**Software Engineering:** What is software, Evolution of Software, Characteristics of software, Types of Software, Applications of software, Layered Technology. **Software Process Models:** Linear Sequential model, Prototype model, RAD model, Incremental model, Spiral Model, Component Based Development Model.	8
2	**Managing Software Project** **The Management Spectrum:** People, Product, Process, Project. Software Process and Project Metrics – Measures and Metrics, Software Measurement- Size Oriented Metrics, Function Oriented Metrics, Metrics for Quality-Overview, Measuring Quality, DRE. Software Requirement Specification-Problem Analysis, Requirement Specification. Validation and verification, The Make /Buy Decision.	7
3	**System Design:** Introduction, design principles, Problem partitioning, abstraction, top-down and bottom-up design, Low level Design: Modularization, Structure Chart, Flow chart, Functional versus Object oriented approach, design specification, Design verification, monitoring and control.	7
4	**Coding:** Top–down and bottom-up structured programming, information hiding, programming style, internal documentation, verification, monitoring and control. **Software testing:** Software Testing fundamentals, white box testing, Basis path testing, Cyclomatic Complexity, A strategic Issues, Unit testing, Integration testing, validation testing, System Testing.	7

5	**Software Project Management:** Cost estimation, project scheduling, Software configuration management, Quality assurance, Project Monitoring, Risk management.	7

COURSE OUTCOMES: The students would have learnt

CO1. The fundamentals of Software Engineering.
CO2. How to apply the Software Engineering Lifecycle.
CO3. Understand of different Software architectural styles & process framework.
CO4. Describe Software measurement & Software risks.
CO5. To develop a Project.

Text Books:

1. Software Engineering by Bharat Bhushan Agrawal, Sumit Prakash Tayal,

Reference Books:

1. Software Engineering by Pressmen
2. Software Engineering by Pankaj Jalote
3. Software Project Management by Manish Kumar Jha.

Sub Title: INFORMATION THEORY & CODING		
Sub Code: CS205TPE02	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Introduce the principles and applications of information theory.
- To teach study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies.
- To teach coding schemes, including error correcting codes.
- Explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problem

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** Uncertainty, properties of information, Measures of information, Entropy: properties of entropy, information rate, conditional Entropy, Mutual Information.	8
2	**Channel Capacity:** Introduction, Shannon's Theorem, Continuous Channel, Capacity of Gaussian Channel: Shannon Hartley Theorem Bandwidth and S/N Trade-off.	7
3	**Channel Coding:** Introduction, Shannon-Fano Coding, Huffman Coding, Block Codes, Tree Codes, Cyclic Code, Hamming Codes, Convolutional Code.	7
4	**Compression:** Introduction, Types of Compression, Lossless and Lossy Compression, Binary Image Compression Schemes: Runlength Encoding, CCITT Groups, Video Compression.	7
5	**Cryptography:** Introduction, Types of Cryptosystems: Secret-key cryptosystem, Public-key cryptosystem, Encryption, Decryption, Ciphers and Secret Message, Cryptanalysis.	7

COURSE OUTCOMES: The students would have learnt

CO1. Apply information theory in source coding and channel coding.
CO2. Understand how error control coding techniques are applied in communication systems.
CO3. Understand linear block codes for error detection and correction.
CO4. Understand various error control encoding and decoding techniques.
CO5. Students will understand the basic concepts of Cryptography.

Text Books:

1. Information Theory, Coding and Cryptography by Ranjan Bose, Tata McGraw-Hill Education.
2. Communication System by R. P. Singh, S. D. Sapre, Tata McGraw-Hill.
3. Information Theory and Coding Techniques by J.S. Chitode and P.G. Chilveri, Technical Publication.

Reference Books:

1. Elements of Information Theory" by T. M. Cover and J. A. Thomas, John Wiley & Sons, New York.
2. Information Theory, Coding and Cryptography" by R. Bose, TMH.

Sub Title: MOBILE COMMUNICATION		
Sub Code: CS205TPE03	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Discuss the evolution of Mobile communication and cell concept to improve capacity of the system.
- Discuss the radio transmission of Mobile communication.
- Discuss the concept of GSM, DECT and TETRA.
- To know about infrastructure and infrastructure less network.
- Discuss the concept of mobility i.e. Mobile IP and TCP

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** Applications: Vehicles, Emergencies, Business, Replacement of wired networks, Infotainment, Location dependent services. Mobile and wireless devices, history of wireless communication, Reference Model.	8
2	**Wireless Transmission:** Frequencies for Radio Transmission, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System Medium Access Control Hidden And Exposed Terminals, Near and Far Terminals, SDMA, FDMA, TDMS, CDMA, Comparison Among Multiple Access Protocols.	7
3	**Telecommunications Systems:** GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and Calling, Handover, Security, New Data Services. Dect, Tetra	7
4	**Wireless Lan:** Infrared vs radio transmission, Infrastructure and ad-hoc network, **IEEE 802.11:** System architecture, protocol architecture, Physical layer, medium access control layer, MAC management, 802.11b, 802.11a, Newer developments, HIPERLAN, Bluetooth.	7
5	**Mobile Communication Layers:** Mobile network layer: Mobile IP, Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6. DHCP, Mobile Ad-hoc Routing, Mobile TCP, File System	7

COURSE OUTCOMES: The students would have learnt

CO1. Understand the evolution of Wireless communication.
CO2. Understand the concept of cellular system.
CO3. Understand the working of GSM.
CO4. Understand the infrastructure less network like Bluetooth.
CO5. Understand the concept of Mobility in mobile communication.

Text Books:

1. Mobile Communications by J. Schiller, Addison Wesley
2. Mobile IP by Charles Perkins, Addison Wesley.

Reference Books:

1. Ad hoc Networks by Charles Perkins, Addison Wesley.
2. Understanding WAP by M. V. D. Heijden, M. Taylor, Artech House.

Sub Title: MULTIMEDIA SYSTEM DESIGN		
Sub Code: CS205TPE04	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Understand technical aspect of Multimedia Systems.
- Discuss the standards available for different audio, video and text applications.
- Understand organization of multimedia database.
- Discuss various multimedia authoring systems.
- To develop multimedia application and analyse the performance of the same

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** An introduction, Multimedia elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Defining Objects for Multimedia systems, Multimedia Data Interface Standard, The need for data Compression, Multimedia databases.	8
2	**Compression Techniques:** Compression and Decompression, Types of compression, Binary Image Compression schemes, Color, Gray Scale, Still-video image Compression, Video Image Compression, Audio Compression, Fractal Compression.	7
3	**Formats**: Data and Format Standards, Rich-text Format, TIFF File Format, Resource Interchange File Format (RIFF), MIDI File Format, JPEG DIB File Format for still and Motion Images, MPEG standards Pen Input, Video and Image Display systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Digital Camera, Video Images and Animation, Full-Motion Video.	7
4	**Storage:** Storage and Retrieval Technologies, Magnetic Media Technology, Optical Media, Hierarchical Storage Management, Cache management for storage systems, Multimedia Application Design, Multimedia application classes, Types of multimedia systems, Components of multimedia systems, Organizing multimedia databases.	7

5	**Multimedia Design:** Unified Communication, video conferencing and Chat, Multimedia Authoring and User Interface, Multimedia authoring system, Hypermedia application design consideration, User interface design, Object display/playback issues, Multimedia Operating Systems introduction, real time, Resource management, process management, file systems.	**7**

COURSE OUTCOMES: The students would have learnt

CO1.	Various technical aspect of Multimedia systems.
CO2.	Various file formats for audio, video & text media.
CO3.	Develop various Multimedia systems applicable in real time.
CO4.	Concept of storage management of Multimedia system.
CO5.	To evaluate multimedia application for its optimum performance.

Text Books:

1. Multimedia System Design by Prabhat K. Andleigh & Kiran Thakrar, Prentice PTR, NJ.
2. Multimedia: computing communications and applications by Ralf Steinmetz and Klara Nahrstedt, Innovating technology series by Pearson Edu. Asia.

Reference Books:

1. Multimedia Communications, Directions & Innovations by Jerry D. Gibson, HarcourtIndia Pvt. Ltd.
2. Multimedia computing by Borko, Handbook of CRC Press.
3. Multimedia Applications Development by Mark J. Bunzel Sandra K. Morris, McGraw Hill.
4. Fundamentals of Multimedia by Ze-Nian Li, Mark S. Drew, by Pearson Edu. Asia

Sub Title: RELATIONAL DATA BASE MANAGEMENT SYSTEM LAB	
Sub Code: CS205PPC05	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =30+20**

Lab Objective:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques & product-specific tools.
- To familiarize the participant with the nuances database environment towards information-oriented data processing-oriented framework
- Give a good formal foundation on the relational model of data.
- To prevent SQL and procedural interface to SQL comprehensively.
- To give an information to systematic database design approaches covering conceptual design, logical design and all overview of physical design.

UnitNo.	Syllabus Content	Teaching Hours
I, II, III, IV and V	• Write the queries for Data Manipulation and Data DefinitionLanguage. • Write SQL queries using logical operations and operators. • Write SQL query using group by function. • Write SQL queries for group functions. • Write SQL queries for sub queries, nested queries. • Write a program by the use of PL/SQL. • Write SQL queries to create views. • Write an SQL query to implement JOINS. • Write a query for extracting data from more than one table. • Write a query to understand the concepts for ROLL BACK,COMMIT & CHECK POINTS.	18

LAB OUTCOMES: The students would have learnt

- Understand, appreciate and effectively explain the underlying concepts of database technologies.
- Design and implement a database schema for a given problem domain normalize a database.
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraint on a database using a state-of-the-art RDBMS.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

Text Books:

1. An Introduction to Database System, Date C J, Addision Wesley
2. Database Concepts, Korth, Silbertz, Sudarshan, McGraw Hill
3. Fundamentals of Database Systems, Elmasri, Navathe, Addision Wesley
4. Database Management System, Leon & Leon, Vikas Publishing House.

Reference Books:

1. An introduction to Database Systems, Bipin C. Desai, Galgotia Publication
2. Database Management System, Majumdar & Bhattacharya, TMH
3. Database Management System, Ramakrishnan, Gehrke, McGraw Hill
4. Database Processing: Fundamentals, Design and Implementation, Kroenke, Pearson Education.
5. DBMS: Complete Practical Approach, Maheshwari Jain, Firewall Media, New Delhi

Sub Title: PARALLEL COMPUTING LAB	
Sub Code: CS205PPC06	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =30+20**

Lab OBJECTIVE:

- To study about various platform and libraries of parallel processing.
- To study about to create MPI programs to accomplish a computational task
- To study about of API to carried out MPI
- To study about to know GPU importance in parallel programming
- To study about of shared memory in parallel

Unit No.	Content	Teaching Hours
I, II, III, IV and V	• Understanding the environment of OMP, MPI, CUDA • Parallel programming environment and platform. • Create and simulate multiple processes and threads on MP system. • Simulate parallel program to synchronization and pooling ofprocesses. • Simulate the loop and function in parallelism manner. • Simulate a parallel algorithm to perform some mathematicalcalculation and their execution time. • Simulate the parallel sorting algorithm and their execution time. • Simulate the parallel searching algorithm and their execution time. • Simulate parallel some operation on array and list with theirexecution time. • Optimization technique using shared memory module on MPsystem. • Heterogeneous calculation using PYTHON (PTK), CUDA, andOPENCL tool kit.	18

LAB OUTCOMES: The students would have learnt

- Simulate and create process & threads.
- Simulate parallel algorithm using various MPI.
- Simulate parallel program for many computational tasks.
- Simulate various memories to carry out optimization.
- Do synchronous and asynchronous of process and pooling.

Text Books:

1. Programming Massively Parallel Processors: A Hands-on Approach Paperback – 20 December 2012 by David B. Kirk , Wen-mei W. Hwu
2. Introduction to Parallel Algorithms 1st Edition by Joseph JaJa.

Reference Books:

1. Python Parallel Programming Cookbook Paperback – August 26, 2015 by Giancarlo Zaccone

Sub Title: DESIGN AND ANALYSIS OF ALGORITHMS		
Sub Code: CS206TPC11	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To Analysis efficiency of algorithms on the basis of their time complexity and space complexity by mathematically foundation (asymptotic notation)
- To study about design and analysis of divide and conquer and greedy algorithm on the basis of their attributes and also describe when could be used these technique and which situation for which problem
- To know dynamic programming(DP) paradigm and algorithm for problems on the different data structure like graph and array
- Know a branch and bound technique and backtracking technique for problems
- Know the classes of problems like P,NP on their basis of nature (running time complexity)

UNIT No	Syllabus Content	No of Hours
1	**Algorithms Analysis:** Space and Time Complexity, Asymptotic Notations, mathematical foundations: growth functions, complexity analysis of algorithms, Recursive algorithms, analysis of no-recursive and recursive algorithms, Recurrences equation and their solution. Master method, recursive tree and backward substitution method.	8
2	**Divide & Conquer and Greedy Method:** Divide and conquer-Finding Maxima and Minima Binary search, Merge Sort, Quick Sort, and selection sort. Stassen's Matrix multiplication Greedy method-introduction, Knapsack problem, travelling sales person problem, Minimum Spanning trees- kruskal's algorithm, prim's algorithm, Single source shortest path-Dijkstra's algorithm, Huffman codes.	7
3	**Dynamic Programming and Search Techniques:** Dynamic Programming: Introduction, Matrix chain multiplication, Single source shortest path-Bellman-Ford, all pairs shortest path, optimal binary search tree, o/1 knapsack problem, travelling sales person problem, longest common subsequence Search techniques: Techniques for binary trees, techniques for graphs –DES and BFS, connected components, Bi-connected components, and Strongly- connected components, Topological sorting.	7

	Heap Data Structure: Min and Max Heap, Fibonacci Heap, Binomial heap, Amortized Analysis, Heap sort.	
4	**Back Tracking and Branch and Bound:** Backtracking: Back tracking and Recursive back tracking, applications of back tracking paradigm, the 8-queen problem, graph coloring, Hamiltonian cycles. **Branch and Bound:** introduction, 0/1 knapsack problem, travelling sales person problem, Least Cost (LC) search – the 15-puzzle problem.	**7**
5	**Complexity Class Theory and Pattern Matching:** Problem classes, Optimization problem, decision making problem, P VS NP VS NPC VS NPH, Venn diagram and their analysis, deterministic and non-deterministicpolynomial time algorithm, Cook Levin theorem, Verification algorithms forsome NP Class: subset sum problem, clique problem, vertex cover,independent set problem, Circuit Satisfiability problem, 2-SAT, 3-SAT etc. Pattern matching: Basic concept of pattern reorganization and their algorithms.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Technique to calculate and obtain the running time complexity and space complexity of any kind of algorithm.

CO2: Design divide and conquer and greedy algorithm for problems and at the same time they will able to know that which data structure are adequate to enhance the running time complexity.

CO3: Spontaneously able to described and analyze the dynamic-programming (DP) algorithm moreover when an algorithmic design situation calls for it and can construct a new DP algorithm for given a particular problem.

CO4: Spontaneously able to construct and design branch & bound and backtracking algorithm for a particular problem on the basis of the problem nature analysis and requirement.

CO5: Analyzed and write verification algorithm for some NP and NPH class problems.

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, "Introduction to Algorithm", Publisher PHI. ISBN 81-203-2141-3
2. Sanjoy Dasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Algorithms, Tata McGraw-Hill, 2008
3. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
4. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Interne Examples, Second Edition, Wiley, 2006.

Reference Books:

1. Udi Manber, Algorithms – A Creative Approach, Addison-Wesley, Reading, MA, 1989.
2. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997.

Sub Title: JAVA		
Sub Code: CS206TPC12	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To discuss the fundamental concepts of OOPs and Java
- To discuss the Differences between C/C++ and Java.
- Knowledge of Multithreading, Packages and Applet.
- Use of Java on different Platform.
- Learn to develop a small project using Java

UNIT No	Syllabus Content	No of Hours
1	**Java Fundamentals:** Basic Concepts of Object-Oriented Programming, Java History, Java Features, How Java Differs from C and C++, Web Browsers, Java Environment, Java Program Structure, Java Tokens, Installing and Configuring Java, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style.	**8**
2	Constants, Variables and Data Types, Declaration of Variables, Giving values to variables, Scope of Variables, Symbolic Constants, Type Casting, Getting Values of Variables, Standard Default Values, Java Operators, Arithmetic Expression, Evaluation of Expressions, Precedence of Arithmetic Operators, Operator Precedence and Associativity, Mathematical Functions, Control Statements (if statement, switch statement and Conditional operator statement), Decision Making and Looping (while construct, do construct, for construct), Jumps in Loops.	**7**
3	**Class, Objects and Methods:** Introduction of Class, defining a Class, Fields Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, **Inheritance:** Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Abstract Methods and Classes, Visibility Control **Introduction of Array:** One Dimensional Array, Creating an array, Two-Dimensional arrays, Strings, Wrapper Classes. **Interfaces:** Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables, **Packages:** Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes, Static Import.	**7**

4	**Introduction to Multithreaded Programming:** Difference between Multithreading and Multitasking, Creating threads, Extending the thread class, Stopping and Blocking a thread, Life Cycle of a thread, Using thread Methods, Thread Exception, Thread Priority, Synchronization, Implementing the Runnable Interface, Inter-thread Communication. Managing Errors and Exceptions: Types of Errors, Exceptions, Syntax of	**7**
5	Introduction of Applet Programming, How Applets Differ from Applications, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable Applet, designing a Web Page, Applet Tag, Adding Applet to HTML file, Running the Applet, Passing Parameters to Applets, Aligning the Display, Displaying Numeric values, Getting input from the user, Event handling, Introduction of Graphics Programming, Introduction to AWT package, **Managing Input/Output Files in Java:** Concept of Streams, Stream Classes, Byte Stream Classes, Character Stream Classes, Other useful I/O classes, Using the file class, Input/Output exceptions. .	**7**

COURSE OUTCOMES: The students would have learnt

CO1.	Understanding of basic concept of java programming.
CO2.	Knowledge of the structure of java.
CO3.	The concept of Exception handling, Package and Applet.
CO4.	To use the Java programming language for various programming technologies.
CO5.	To develop a Software in the Java programming language.

Text Books:

1. E. Balagurusamy, Programming with Java A Primer, Fourth Edition, McGrawHill, 2010.

Reference Books:

1. H. Schildt, Java TM 2: The Complete Reference, Fourth Edition, Tata McGraw-Hill, 2001.
2. K. A. Mughal and R. W. Rasmussen, A Programmer's Guide to Java TM SCJP
3. Certification A Comprehensive Primer, Third Edition, Addison Wesley, 2008

Sub Title: DIGITAL IMAGE PROCESSING		
Sub Code: CS206TPC13	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE: The students would have learnt

- To discuss the fundamental concepts of digital image processing.
- To discuss the various image, transform with respect to basic functions, properties and application.
- To discuss image enhancement technique in spatial and frequency domain.
- To discuss image segmentation and restoration technique in spatial and frequency domain.
- To discuss the simple image processing techniques.

UNIT No	Syllabus Content	No of Hours
1	**Digital Image Fundamentals:** Background, digital image representation, examples of field that use DIP, fundamental steps in digital image processing, Simple image model, basic relationships between pixels: neighborhood of a pixel, Connectivity, Basic transformations: translational, rotational, scaling. Color models and transformations, Pseudo color Image Processing.	**8**
2	**Image Transforms:** Introduction to 2D Transforms: Fourier Transform and Properties, DCT and Properties, Hadamard Transform and Properties and properties **Image Compression:** Fundamentals, image compression models, elements of Information theory, Image Compression: lossy and non-lossy compression, image compression standards.	**7**
3	**Image Enhancement Spatial Domain:** Background, Basic gray level transformations, histogram: Computation histogram , histogram specification, histogram equalization, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing sharpening spatial filters, combining spatial enhancement methods. **Edge Detection Methods:** Prewitt, Sobel and Robert **Frequency Domain:** Background, introduction to the frequency domain, smoothing and sharpening frequency domain filters, homomorphic filtering, generation of spatial masks from frequency domain specifications.	**7**
4	**Image Segmentation:** Detection of discontinuities, edge linking & boundary detection, thresholding, Region based segmentation, morphological water sheds, the use of motion in segmentation	**7**

5	**Image Restoration:** Degradation model, Noise models, restoration in the presence of noise only (Spatial and frequency domain filters), Inverse filtering, LMS filtering, Wiener filter, constrained least square restoration, interactive restoration, restoration in the spatial domain	**7**

COURSE OUTCOMES: The students would have learnt

CO1.	Understanding of basic image processing techniques.
CO2.	Image analysis using 2-D image transforms.
CO3.	Image enhancement technique in spatial and frequency domain.
CO4.	Image processing application such as compression, segmentation and restoration.
CO5.	Learn to apply different image processing technique.

Text Books:

1. Digital Image Processing, R C Gonzalez & R E Woods, PearsonEducation,3 edition.
2. Digital Image Processing and Computer Vision, Milan Sonka, Cengage learning, First edition.

Reference Books:

1. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veera Kumar, Tata McGraw Hill, 2009.
2. Fundamentals of Digital Image processing, A K Jain, PHI/PearsonEducation,1989.
3. Digital Image Processing, Sid Ahmed, McGraw Hill.

Sub Title: MANAGEMENT INFORMATION SYSTEM		
Sub Code: CS206TPE05	**No. of Credits: 3=3: 0: 0 (L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
- To provide the theoretical models used in database management systems to answer business questions.

UNIT No	Syllabus Content	No of Hours
1	**Information System:** Introduction of Information System, Fundamentals of Information System, Strategic Role of Information in Organization and Management, three dimensions of Information System, Information System and Organization, Business Process Re-Engineering, Traditional and Computer based information system.	8
2	**Decision Support System:** Integration of Information, Types of Decision making in Organization, Decision Making Process, Models and Decision Support, Decision in business Areas, Strategic Analysis	7
3	**Information System Planning**: Types of Controlling Information System, Development of MIS Methodology and Tools/Techniques for Systematic Identification, Evaluation, Modification of MIS, Information System Success and Failure Implementation	7

4	**Information System for Business Operations:** Cross Functional Information System, A study of major Financial, Production, Human Resource Information System and Marketing Information System.	**7**
5	**Security and Auditing of Information System:** Management of Information System and End-User Computing, Security and Ethical issues of Information System, Major issues in Information System, Auditing of Information System.	**7**

COURSE OUTCOMES: The students would have learnt

- CO1. Relate the basic concepts and technologies used in the field of management information systems.
- CO2. Compare the processes of developing and implementing information systems.
- CO3. Outline the role of the ethical, social and security issues of information systems.
- CO4. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
- CO5. Apply the understanding of how various information systems like DBMS work together to accomplish information objectives of an organization.

Text Books:

1. Management Information System: A Contemporary Perspective, Kenneth C. Laudon and Jane Price Loudon, Maxwell Macmillan International Editions.

Reference Books:

1. Management Information System: Solving Business Problems with Information Technology, Gerald V. Post and David L. Anderson, Tata McGraw – Hill Edition
2. Management Information System: Managing Information Technology in the Internet worked Enterprise, James A. O'Brien Tata McGraw –Hill Edition, Fourth Edition.

Sub Title: ROBOTICS		
Sub Code: CS206TPE06	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Learn the basic concepts of Robots.
- Learn the concepts of Kinematics of Robotics.
- Learn the concepts of Motions, velocities and dynamic analysis of force.
- Learn the concepts of Motion and Trajectory planning.
- Learn the concepts of Potential Functions, Visibility Graphs and Coverage Planning.

UNIT No	Syllabus Content	No of Hours
1	Introduction to Robotics Evolution of robots and robotics, progressive advancement in robots, definitions and classifications, laws of robotics, robot anatomy and related attributes, human arm characteristics, robot control system, manipulation and control, sensors in robotics, robots programming, the future prospects. .	**8**
2	10 Coordinate Frames, Mapping and Transforms Robot specification and notations, Coordinate frames, description of objects in space, transformation of vectors, inverting a homogeneous transform, fundamental rotation matrices, yaw pitch and roll, yaw pitch and roll transformation, equivalent angle.	**7**
3	Symbolic Modelling of Robots – Direct Kinematic Model Mechanical structure and notations, description of links and joints, kinematic modelling of the manipulator, Denavit – Hartenberg notation, kinematic relationship between adjacent links, manipulator, transformation matrix, introduction to inverse kinematic model, Artificial Intelligence in robotics.	**7**
4	Robotic Sensors and Vision The meaning of sensing, sensors in robotics, kinds of sensors used in robotics, robotic vision, industrial applications of vision- controlled robotic systems, process of imaging, architecture of robotic vision systems, image acquisition, description of other components of vision system, image representation, image processing.	**7**

5	Robot Applications Industrial applications, material handling, processing applications, assembly applications, inspection, application, principles for robot application and application planning, justification of robots, robot safety, non-industrial applications, robotic application for sustainable development & social issues.	**7**

COURSE OUTCOMES: The students would have learnt

CO1. Apply the basic concepts of Robots.
CO2. Apply and evaluate the concepts of Kinematics of Robotics.
CO3. Apply the Motions, velocities and dynamics analysis of force.
CO4. Apply and evaluate Motion and trajectory planning.
CO5. Apply the concepts of potential functions, visibility graphs and coverage planning.

Text Books:

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers –Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications –M. P. Groover, M. Weiss.
4. Robotics Control Sensing, Vision and Intelligence –K. S. Fu, R. C. Gonzales, C. S. G. Lee-McGrew Hill Book co.

Reference Books:

1. Kinematics and Synthesis of linkages –Hardenberg and Denavit– McGrew Hill Book Co
2. Kinematics and Linkage Design – A.S. Hall – Prentice Hall
3. Kinematics and Dynamics of Machinery–J. Hirschhorn– McGrew Hill Book Company

Sub Title: ARTIFICIAL INTELLIGENCE		
Sub Code: CS206TPE07	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.
- To introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems
- To review the different stages of development of the AI field from human like behavior to Rational Agents.

UNIT No	Syllabus Content	No of Hours
1	Introduction of Artificial Intelligence(AI), Difference between Intelligence and Artificial Intelligence, Definitions of AI, Strong AI and Weak AI, Application areas of AI, Comparison of Conventional and AI Computing, History of AI, Turing Test, Branches of AI, Intelligent Agents, State Space Representation, Production System, Heuristic Search, Search Methods (Uninformed Search and Informed Search), Breadth First Search, Depth First Search, Difference between Breadth First Search and Depth First Search, Hill Climbing, Best First Search.	**8**
2	Role of Knowledge Representation in AI, Types of Knowledge, Properties of Knowledge Representation System, Categories of Knowledge Representation Scheme, First Order Predicate Calculus, Well Formed Formula in Predicate Logic, Conversion to Clausal Form, Resolution in Predicate Logic, Semantic Nets, Properties of Semantic Nets, Frames, Scripts, Advantages and Disadvantages of Scripts.	**7**
3	Introduction of Expert System, Comparison between Human Expert and Expert System, Comparison between Expert System and Software System, Difference between Knowledgebase and Database, Basic Components of an Expert System, Characteristics of Expert System, Life Cycle Development of Expert System, Advantages of Expert System, Limitation of Expert System, Expert System Tools, Existing Expert Systems (DENDRAL and MYCIN).	**7**

4	**Introduction to LISP:** Syntax and Numeric Functions, Working with GNU CLISP, Basic Data Objects in GNU CLISP, Basic List Manipulation Functions in GNU CLISP (setq, car, cdr, cons, list, append, last, member, reverse), User Defined Functions in GNU CLISP, Predicates (atom, equal, evenp, 69odell, oddp, zerop, >=, <=, listp, null) and Conditionals (cond and if) in GNU CLISP, Logical Functions (not, or, and) in GNU CLISP, Input / Output and Local Variables (read, print, princ, terpri, format, let, prog) in GNU CLISP, Recursion and Iteration(do) in GNU CLISP, Arrays in GNU CLISP	**7**
5	Introduction to PROLOG, Term, Ground Term, Function, Predicate, Features of PROLOG, Program Clause, Unit Clause, Logic Program, Goal Clause, Empty Clause, Simple Query, Conjunctive Query, Structure of PROLOG Program, Working with SWI-Prolog General Syntax of PROLOG, Execution of a Query in Logic Program (Ground Query and Non-Ground Query), Law of Universal modus pone, Ground Reduction, PROLOG Control Strategy, Search Tree and Proof Tree, Relational and Arithmetic Operators, Recursion in PROLOG, Lists manipulation in PROLOG, Iterative programming in PROLOG.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.

CO3: Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO4: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO5: Formulate and solve problems with uncertain information using Bayesia approaches.

CO6: Apply concept Natural Language processing to problems leading to understanding of cognitive computing

Text Books:

1. E. Rich and K. Knight, Artificial Intelligence, Forty Sixth Edition, Tata McGrawHill,2007.
2. D.W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Tenth Edition, Prentice Hall of India, 2001.

Reference Books:

1. S. Kaushik, Logic and Prolog Programming, New Age International Limited, 2006.

Sub Title: SOFTWARE TESTING AND QUALITY ASSURANCE		
Sub Code: CS206TPE08	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To discuss the fundamental concepts of Software Quality
- Finding defects which may get created by the programmer while developing the software.
- To make sure that the end result meets the business and user requirements.
- To gain the confidence of the customers by providing them a quality product.
- Gaining confidence in and providing information about the level of quality.

UNIT No	Syllabus Content	No of Hours
1	**Software Quality:** Ethical Basis for software Quality, Total quality Management Principles, Software Processes and Methodologies, Quality Standards, Practices & conventions	8
2	**Software Management:** Reviews and Audits. Enterprise Resource Planning Software, Measurement Theory, Software Quality Metrics, designing Software Measurement Programs, Organizational Learning.	7
3	**Improving Quality with Methodologies:** Structured information Engineering Object-Oriented Software, Reverse Engineering, Measuring Customer Satisfaction Defect Prevention, Reliability Models, Reliability Growth Models.	7
4	**Software Quality Engineering:** Defining Quality Requirements Management, Complexity Metrics and Models, Management issues for software Quality, Project Tracking and Oversight, Use of CASE tool Technology, Role of Groupware, data Quality Control.	7
5	**Project Configuration Management:** Configuration Management Concepts, Configuration Management Process, Document Control, Configuration Management plan of the WAR Project. **Software Testing:** Unit, Integration & System testing, Benchmarking and Certification.	7

COURSE OUTCOMES: The students would have learnt

CO1.	Understanding basic concepts of software testing and quality assurance.
CO2.	Define the scope of software testing and quality assurance projects.
CO3.	Efficiently perform testing and quality assurance activities using modern software tools.
CO4.	Estimate cost of a testing and quality assurance project and manage budgets.
CO5.	Prepare test plans and schedules for a testing and quality assurance project.

Text Books:

1. Mark Paulik, The capability Maturity Model-guidelines for Improving the software Process, Addison Wesley
2. Wilson, Rodney C, Software RX secrets of Engineering Quality Software, Prentice Hall.

Reference Books:

1. Stephan Kan, Metrics and Models in Software quality, Addison Wesley.
2. Ginac, Frank P, Customer Oriented Software Quality Insurance, Prentice Hall

Sub Title: DESIGN AND ANALYSIS OF ALGORITHMS LAB	
Sub Code: CS206PPC07	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =30+20**

Lab OBJECTIVE:

- Understand the recursive type algorithm with their data structure
- Understand the divide and conquer (with recursive function) and greedy algorithm like merge sort, quick sort and single source shortest path
- Understand the dynamic programming paradigm and analysis the single source and all pair shortest path algorithm
- Understand the branch and bound technique ,heap and Fibonacci data structure to implement optimization and sorting problem
- Analysis about some NP class problems

Unit No.	Syllabus Content	Teaching Hours
I, II, III, IV and V	● Simulate the Stack data structure (recursion) and do the posteriori analysis. ● Simulate BFS, DFS on Graph and estimate the running time. ● Simulate Prim's and Kruskal's Algorithm and do the posteriori analysis ● Simulate Dijkstra's algorithm and do the posteriori analysis ● Simulate all pair shortest path problem and do the posteriori analysis ● Simulate Bellman algorithm and do the posteriori analysis ● Simulate of Huffman Tree and do the posteriori analysis ● Simulate of check whether a given graph is connected or not using DFS method and do the posteriori analysis ● Simulate of Heap Tree and heap sort and do the posteriori analysis ● Simulate of N Queen's problem using Back Tracking and do the posteriori analysis ● Simulate 0/1 Knapsack problem using Dynamic Programming and do the posteriori analysis ● Simulate TSP problem using Dynamic Programming and do the posteriori analysis ● Simulate fractional Knapsack problem and do the posteriori analysis ● Simulate to find a subset sum of a given set of integer number and do the posteriori analysis ● Simulate to detect the circle in graph by using DFS algorithm and do the posteriori analysis	18

LAB OUTCOMES: The students would have learnt

CO1.	Implement recursive algorithm with array and stack data structure.
CO2.	Various tools to simulate divide & conquer algorithm and greedy using graph and link list.
CO3.	Dynamic programming to optimization type and decision type problems.
CO4.	Implement some problems like data compression algorithm and sorting algorithm using tree, array, etc.
CO5.	Simulate and optimize some NP class problem like SAT, Clique and TSP etc.

Text Books:

1. Introduction to Algorithm, Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, Publisher PHI, ISBN 81-203-2141-3
2. Algorithms, Sanjoy Dasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Tata McGraw- Hill, 2008.
3. Python Algorithms Mastering Basic Algorithms in the Python Language by Magnus LieHetland.
4. Algorithm Design, Jon Kleinberg and Éva Tardos, Pearson, 2005.

Reference Books:

1. Fundamentals of computer Algorithms, Horowitz, Sahani, Galgotia. 2nd Edition, 1998.ISBN 81- 7515-257-5
2. Data Structures and Algorithms Using Python Rance D. Necaise

Sub Title: JAVA LAB	
Sub Code: CS206PPC08	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =30+20**

Lab OBJECTIVE:

- To provide the knowledge of Basics of Java.
- To learn the Concept of package and Applet in Java.
- To develop an awareness of modern programming language.
- Provide practical Knowledge and Skills for developing a program with java.
- Develop ability to design a small software using java.

Unit No.	Content	Teaching Hours
I, II, III, IV and V	● Write a program to find a factorial of a given number. ● Write a program to show all relational and Logical operator. ● Write a program using Constructors ● Write any program using the concept of method overloading. ● Write a program to show the concept of Inheritance. ● Write a program to using 10 string operations ● Write a program using packages ● Write a program to show the concept of Synchronization inMultithreading. ● Write a program to show exception handling in java ● Write a program to show human face using Applets	18

LAB OUTCOMES: The students would have learnt

CO1.	The basic concept of Java.
CO2.	Use an integrated development environment to write, compile, run & test simple object-oriented java program.
CO3.	About concept of Multithreading, Packages & Applet.
CO4.	Read and make elementary modifications to java programs that solve real world problems.
CO5.	To develop small software using java.

Text Books:

1. Programming with Java A Primer, E. Balagurusamy, Fourth Edition, McGrawHill, 2010.

Reference Books:

1. Java TM 2: The Complete Reference, H.Schildt, Fourth Edition, Tata McGrawHill, 2001.
2. A Programmer's Guide to Java TM SCJP Certification A Comprehensive Primer, K. A. Mughal and R. W. Rasmussen, Third Edition, Addison Wesley, 2008.

Sub Title: Industrial Utilities and Safety		
Sub Code: CH206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE:
To acquire the basic knowledge about various process utilities applied in industries and problemsrelated to hazard & safety.

UNIT No	Syllabus Content	No of Hours
1	Introduction: Role and types of process utilities in industries. Case studies of some major accidents occurred inprocess industries	**8**
2	Steam System: Generation and application in process plants. Introduction to design of efficient steam heatingsystems, Condensate utilization. Flash steam. Steam Traps: Types and characteristics.	**7**
3	Water, characteristics and conditioning for process industries e.g., steam piping, boiler feed, cooling etc.,Recycling of process water.	**7**
4	Introduction to process safety devices and general hygiene management. Storage and ventilation.	**7**
5	Fire and Explosion; Definition, flammability characteristics and explosion. Design to prevent fires and explosions by inverting, purging, ventilation, sprinkler systems. Static electricity controls, Relief valve in vapour/gas,Liquid and runway reaction services.	**7**

COURSE OUTCOMES: The students would have learnt

CO1. Evaluate the requirement of process utilities in process industries,
CO2. Calculate the steam requirement and its applications as utility.
CO3. Explain fire and explosion and its prevention methods.

Suggested Text Books:

1. High Temperature heat carrier by A. V. Chechetekin, Pergammon Press.
2. Efficient use of Steam by P. M. Goodal, Guilford
3. Chemical Process Safety: Fundamental with applications by A. Crowl Daniel and F. L. Joseph, PHI Publications.

Reference Books;

1. Handbook of Heat Transfer media by P. I. Geiringer, Van Nostral Reinhold Inc. U.S.

Sub Title: Metro Systems and Engineering		
Sub Code: CE206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

Course Learning Objectives:

1. To introduce concepts of different types of mode of transportation and associated facilities.
2. To understand the concept of urban transport scenario, traffic characteristics and transport development.
3. To study the Intelligence Transport System
4. To understand ITS user services and its components.
5. To understand the approach and utility of Environmental Impact Assessment for the urban infrastructural Measures.

.

UNIT No	Syllabus Content	No of Hours
1	Modes of Transportation: Transportation parameters- Traffic and Transport Problems of a city, Mass transport system, Modes of transportation & characteristics, public transport system, public private transport system, Advantages and disadvantages of public transport system. Role of transportation in mass transportation, advanced modes. Transportation Infrastructure- Green bays, control stations, mitigation buildings, separator lanes and safety islands.	**8**
2	Urban Public Transport System Rapid transit systems: BRTS, Bus Lane system, Advantages and limitations in Indian Scenario, Rail System. Types of rail system, advantages and disadvantages of rail system, sky walk and under bridge and its advantages. Advances in infrastructure. Urban Pedestrian Safety- Skyways, Intersection subways, halt stations, crossing measures, flexibility in accessibility.	**7**
3	ITS Background and Telemetric systems: Definitions, features and objectives of ITS, History of ITS and its development over the world, telemetric concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses, and application overview, ITS implication through AI, ITS based regression models.	**7**
4	ITS components, tools and strategies: Components of user services; advanced traffic management system, advanced traveler information systems, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment system, advanced rural transportation, security and safety systems, urban traffic control, benefits and limitations, traffic calming systems, freight management by ITS.	**7**

5	Environmental Impact Assessment: Description of proposed activity, structural audits, analysis of site selection procedure, baseline conditions / major concerns, green building and its advantages, description of potential positive and negative environmental, social, economic and cultural impacts including cumulative, regional, temporal and spatial considerations, significance of mitigation plans and monitoring plans (impacts and mitigation efforts)	**7**

COURSE OUTCOMES: The students would have learnt

CO1.	To implement the concept of urban transport scenario, traffic characteristics and transport development.
CO2.	To adopt the concepts of different mode of transportation and associated facilities with advanced system.
CO3.	To Identify and differentiate ITS user services and its components.
CO4.	To plan and design appropriate ITS technology to solve real-life traffic problems.
CO5.	To propose the mitigation plan for the EIA for the urban infrastructure.

Text Books:

1. Kadialy L.R.," Traffic Engg. and Transport Planning", 8th edition, Khanna Publishers, 2011.
2. O. Flaherty C.A., "Traffic Engineering and Transport Planning", 2006.
3. AUSTROADS, The Implication of Intelligent Transport Systems for Road Safety, Austroads Incorporated, 1999.
4. Bob Williams, Intelligent Transport Systems Standards, Artech House Publishers, 2008.
5. Chowdhury, M. A. and Sadek, A, Fundamentals of Intelligent Transp. Sys. Planning, Artech House, 2003.
6. E. Bekiaris and Y.J. Nakanishi, Economic Impacts of Intelligent Transportation Systems: Innovations and Case

   Studies, Elsevier/JAI, 2004.
7. IET Intelligent Transport Systems and 15th International IEEE Conference on Intelligent Transportation Systems

   (ITSC), 16-19 September, 2012. (http://digital-library.theiet.org/content/journals/iet-its)
8. J.M. Sussman, Perspectives on Intelligent Transportation Systems (ITS), Springer, 2005
9. L. Vlacic, M. Parent, F. Harashima, Intelligent Vehicle Tech. – Theory and Appl., Butterworth-Heinemann, 2010.
10. M.A. Chowdhury and A. Sadek, Fundamentals of Intelligent Transport. Systems Planning, Artech House, 2010.
11. R. Stough, Intelligent Transport Systems: Cases and Policies, Edward Elgar, 2001, Artificial Intelligence and Intelligent Transportation Systems, National Academy Press, 2010.
12. Gonzalez R. C. and Woods R. C., "Digital Image Processing", 2nd Ed., Pearson Education, 2007.
13. Jain A. K, "Fundamentals of Digital Image Processing", Prentice Hall, 2007.
14. R.R. Barthwal "Environmental Impact Assessment" New Age International, January 2012.
15. A.R. Gajbhiye & S.R. Khandeshwar N.S. Raman, "Environmental Impact Assessment", I.K. International, 2014

Sub Title: Object Oriented Programming with C++		
Sub Code: CS206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

COURSE OBJECTIVE

- To know different programming paradigms.
- To study and understand the object-oriented programming concepts and methodology.
- To implement object-oriented programming concepts in C++.
- To direct and handling file streaming
- To learn advance concept of Object-Oriented programming.

UNIT No	Syllabus Content	No of Hours
1	Principles of OOP: A look at procedure-oriented programming, OOP paradigm, Basic Concepts of OOPs, Benefits of OOP, object oriented Language. Beginning with C^{++} characters used in C++, Basic Data Types , C++ Tokens, Identifiers, Keywords, Constants, Variables, Input/Output statements, Structure of C^{++} program.	**8**
2	Operations and Expressions - Concept, Arithmetic Operations and Expressions, Relational and Logical operators and Expressions, Order of evaluation of expressions, Type conversion, Compound assignment Operator, Standard Library Functions and header files. Flow of control – Compound statement, sequential structure, selection structure, simple if, if-else nested if, ladder, switch, go to, loop structure, do-while, for, statement break, continue, function exit( )	**7**
3	Array and Function - Concept of array, Concept of subprogram, Parameter passing in function, Function prototype, Calling function, Call by value, Call by reference, Array parameters, Default argument, Returning values, Scope rules, Storage class, Inline function, Function overloading, Recursive functions. Structure, Class and Object - Define structure, Returning structure elements, Nested structure, Passing structure to function, User defined data type, Specifying a class, Defining member function, Scope of class and its member, Nested class, Data Hiding and encapsulation, Friend function, Object as function argument, Function returning object, Static member.	**7**
4	Constructors, Destructors, constructor function, parameterized multiple constructors, Default constructor, Copy constructor and Destructor function.	7

	Inheritance and aggregation - Derived class, various type of inheritance, Inheriting Constructors, Parts explosion as aggregation, Abstraction and property of aggregation, Constructing aggregations. Polymorphism, overloading and operator overloading.	
5	Pointer and virtual function - Pointer variable, dynamic allocationoperators, new and delete, this operator Pointers to derived class, Working with files - File & stream, Opening and closing a file, read() and write( ) functions, detecting end of file.	**7**

COURSE OUTCOMES: The students would have learnt

CO1. Programming environment and basic elements.
CO2. Introduction to object-oriented programming.
CO3. Key features of the object-oriented programming language.
CO4. Advantage concept of object-oriented concepts.
CO5. Streaming concepts for file handling.

REFERENCE BOOKS:

1. Object Oriented Programming With C++ by M. P. Bhave S. A. Patekar, Pearson Education
2. Object Oriented Programming with C++ by E. Balaguruswamy.
3. Object Oriented Programming in turbo C++ by Robert Lafore.
4. Programming with C++ by D. Ravichandan.
5. Programming with C++ (SOS) by Hubbard

Sub Title: Introduction to Electronic Devices & Circuits		
Sub Code: EC206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

Course Objectives:

1. To develop basic concept of semiconductor materials and physics.
2. To develop an understanding of the PN junction diode and its behavior.
3. To introduce various types of special diodes and rectifier.
4. To develop the concept and analysis of transistor characteristics, Configuration and thermal stabilization.
5. To study the physics and construction of Field Effect transistors

UNIT No	Syllabus Content	No of Hours
1	**Semiconductor concept:** Atomic structure, Bohr's atom model, Energy Band Theory of Crystals, Energy Band Structures in Metals, Semiconductors and Insulators, forbidden energy gap, Electrical properties of Ge and Si, Conductivity Equation, Mobility and Conductivity, Electron and holes in intrinsic and extrinsic semiconductors, P type and N type semiconductors– majority and minority carriers, Mass action Law, Hall effect, Carrier generation and recombination, Carrier transport: diffusion and drift process, Variation of semiconductor conductivity, resistance and bandgap with temperature and doping.	**8**
2	**PN Junction Diode:** Properties of P-N Junction, Open Circuited P-N Junction, Behaviour of P-N junction under forward and reverse bias, Current component of PN Diode, VI Characteristics, Temperature dependence of V-I Characteristics, Ideal diode, Breakdown phenomenon: Zener and avalanche breakdown, Diode resistance: Static and dynamic resistance, Diode Capacitance: Transition and Diffusion Capacitance, Switching Characteristics.	7
3	**Special Purpose Diodes:** Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes- Construction, working and characteristics, Applications of Diodes: Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers.	7
4	**Transistors:** Definition, formation of transistor- PNP and NPN, symbols, working principle, Regions of operation, Transistor current components, Transistor construction, Common Base, Common Emitter & Common Collector configurations and their characteristics, Early Effect, Current Gains: α, β, and γ relation between them, simple problems, comparison of CB, CE and CC modes, Transistor as a switch, Transistor as an amplifier, Thermal runaway, Thermal stability.	7

5	**Field Effect Transistor:** JFET Construction, Operation, VI characteristics, Transfer characteristics, Drain characteristics. FET as voltage variable resistor, Metal Oxide Semiconductor Field Effect Transistor (MOSFET): construction and working of enhancement and depletion modes, Drain and transfer characteristics, Application of MOSFET as a switch, Comparison of JFET & MOSFET.	7

Course Outcome:

Upon successful completion of the course, students will be able to

1. Analyze the operation of semiconductor physics.
2. Describe the working principle and characteristics of PN diode.
3. Describe the principle of operation and characteristics of special Semiconductor diodes.
4. Analyze the Bipolar Junction Transistor characteristics and configurations.
5. Analyze the Field Effect Transistor characteristics and its applications.

Text/Reference Books:

1. Integrated Electronics: Analog & Digital Circuit Systems- Jacob Millman & Halkias, TMH
2. Electronic Devices & Circuits- Allen Mottershead, PHI
3. Electronic Devices & Circuit Theory- Boylestad & Nashelsky, PHI
4. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014
5. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
6. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
7. Sanjeev Gupta, “Electronic Devices and Circuits”, Dhanpat Rai Publications.

Sub Title: Computer Graphics		
Sub Code: IT206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

Course Objectives:

1. The main objective of the course is to introduce students with fundamentalconcepts and theory of computer graphics.
2. Understand the need of developing graphics application.
3. Learn algorithmic development of graphics primitives like: line, circle, polygonetc.
4. Learn the representation and transformation of graphical images and pictures.
5. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.

UNIT No	Syllabus Content	No of Hours
1	**OVERVIEW OF GRAPHICS SYSTEM:** I/O devices, Raster scan & Random scan system, DDA & Bresenhams Line drawing Algorithm, Mid-Point & Bresenhams circle drawing Algorithm, Mid-point ellipse generating algorithm, Clipping: Sutherland Cohen Line Clipping, Polygon clipping: Hodgeman- Sutherland & Weiler-Atherton polygon clipping, 2-D & 3-D Transformation.	**8**
2	**CURVES &SURFACES:** Conics-Parametric forms for circle, ellipse, parabola, Bezier Curves-Need for cubic parametric curves c0, c1, c2 continuity, Generation though Bernstein polynomials, Condition for smooth joining of 2 segments, Convex Hull property, B-Spline Curves: Knot vectors-uniform and open uniform curves, Uniform, Periodic B-splines, Open B-splines, Uniform B-splines, Non-uniform B-splines, Rational B-splines, Beta splines.	**7**
3	**PROJECTIONS & HIDDEN SURFACE REMOVAL:** Parallel projection on x-y plane (including oblique view), Perspective projection-1, 2 and 3 Vanishing points, Reconstruction of 3-D images. Hidden Surface Removal: Back face removal, Floating Horizon method for curved objects, Z-Buffer or Depth Buffer Algorithm, Painter's algorithm (Depth sorting method), Binary space partitioning trees, Scan-line algorithm, Warnock's algorithm.	**7**
4	**SHADING & COLOR ISSUES:** Filled Area Primitives, Illumination model for diffused & specular reflection, Computing reflection vector, Gouraud and Phog Shading, Texture mapping, Bump mapping, Handling shadows, Radiosity: Lambert's Law, Basic element, Modeling transparency, Visualization of data sets, volume rendering, Color issues: Additive, Subtractive primaries, Filled Area Primitives.	7

5	**FRACTALS & ANIMATION:** Fractals: self-similar fractals-fractal dimension, Generation of Terrain-random midpoint displacement, Self-squaring fractals. Solid Modeling: Generation through sweep techniques, Constructive sold geometry, B representations, Octrees, Ray Tracing & their Theory, Animation: In-between using rotation and translation, Procedural animation, Morphing, Motion Control (Key framing).	7

COURSE OUTCOMES: The students would have learnt

- CO1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
- CO2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
- CO3. Use of geometric transformations on graphics objects and their application in composite form.
- CO4. Extract scene with different clipping methods and its transformation to graphics display device.
- CO5. Explore projections and visible surface detection techniques for display of 3D sceneon 2D device.

Text Books:

1. Computer graphics, Hearn and Baker, PHI.

Reference Books:

1. Procedural elements of Computer Graphics, Rogers, McGraw Hill
2. Computer graphics, Harringtons S., McGraw Hill
3. Computer graphics, Schoum Series

Sub Title: Automobile Engineering		
Sub Code: ME206TOE01	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week:03**
Exam Duration: 3 hours	**IA+ESE=30+70**	**Total no of contact hours:36**

Course Objective*:*

- To understand the basic structure of an automobile.
- To provide the concept of various subsystem associated with automobiles.
- To get an idea of different types of loads, resistances & safety features present in automobiles.
- To understand the functions of individual components associated with vehicles.
- To get knowledge on modern technology implemented in vehicles

UNIT No	Syllabus Content	No of Hours
1	Introduction: Introduction of an automobile, component & basic structure of automobile, classification, types of chassis layout with reference to prime mover location &drives. Vehicle frames: various types of frames, constructional details, materials, testing of vehicle frames, defects in frames, frameless construction & specifications, loads acting on the vehicle frame, chassis lubrication & calculation of stresses on sections. Front axle & steering system: Types of front axles, construction details, materials. Front wheel geometry viz. castor, camber, king pin inclination, Toe-in. Condition for true rolling motion of wheels during steering. Steering geometry, Ackerman & Davis steering system. Constructional details of steering linkages, different types of steering gears. Power & power assisted steering.	**8**
2	Transmission system: Function of transmission system, types: Sliding mesh, constant mesh & synchromesh gear box. Torque converter: Principle of operation, construction, performance characteristics, multiphase & polyphaser torque converter. Automatic transmission: Epi-cyclic gear box, determination of gear ratios for the vehicles. Clutches. Hydrostatic drive system: Types, principles, advantage & limitation, construction & working. Electric drive: Principle of early & modified Ward Leonard control system, advantages &limitations. Continually Variable Transmission (CVT): Operating principle, basic layout & operation, advantages & disadvantages. Braking system: Necessity of brake, stopping distance & time, brake efficiency, weight transfer, brake shoe, determination of braking torque. Braking systems: Mechanical, hydraulic, disc, drum, parking & emergency brakes. Power, servo & electrical brakes. Details of hydraulic system, mechanical system & components, master cylinder, factors influencing the operation of brakes such as: operating temperature, lining, brake clearance, pedal pressure, linkages etc. Different types of retarders: Eddy current & hydraulic retarders. Antilock braking system.	7

3	Driveline: Effect of driving thrust & torque reactions. Hotchkiss drive & torque tube drive, Propeller shaft, Universal joint, Constant velocity universal joint. Front wheel drive. Final drive & differential: Different types of final drive: Worm & worm wheel, straight bevel gear, spiral bevel gear hypoid gear final drives. Differential principles. Constructional details of differential unit. Non-slip differential.	**7**
4	Suspension & safety system: Need of suspension system, types of front & rear instructional details & characteristics of leaf spring, coil spring & torsion bar. Telescopic type shock absorbers, pneumatic suspension system, air bags, crash resistance & passenger comfort. Rear construction: Construction of rear axles, 4 types of rear axles: full floating, three quarter floating & semi floating rear axles. Rear axle housing. Construction of different types of axle housing. Multi-axle vehicles, constructional details of multiaxle vehicles	7
5	Wheels & tires: Types of wheels, construction, weird wheels, tires, construction, types: radial, bias & belted bias, slip angle, under & oversteering, tread patterns, tire specification, tubeless tire. Modern vehicle technology: Fuel cells technology for vehicles: what is fuel cell? type of fuel cell, advantages, current state of the technology, potential & challenges. Stratified charged/learn burn engines-hydrogen engines, advantages & disadvantages of hydrogen fuel. Electrical & hybrid vehicles, magnetic track vehicle. Latest engine technology features: DTS-I, GDI, Variable valve timing, electromagnetic valves.	7

Course Outcomes*:* The students would have learnt

- Graduates will against wrong foundation in core automobile engineering, both in theoretical & applied concepts.
- Acquire knowledge and hands-on competence in the design & development of an automobile.
- Graduates will be able to demonstrate & get an idea in identifying the problems in automobile.

Suggested Texts and Reference Materials

1. Automobile Engineering, K. K. Ramalingam, Sci tech Publications Pvt Ltd.
2. Automobile Technology, Dr. N. K. Giri, Khanna Publishers.
3. Automobile Engineering, Prof. Amitosh De, Galgotia Publications Pvt Ltd.
4. Modern Transmission Systems, A. W. Judge, Chapman & Hall Ltd.
5. Automotive Mechanics-Principle & Practice, Josepe Heitner, East West Press.
6. Torque Converter, P.M. Heldt, Chilton Book Co.