Third Year - Fifth Semester

Branch: Computer Science and Engineering

Course Code	**CS 501**
Course Title	**DATA COMMUNICATION AND NETWORKS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Structures (CS 301)
Course Objectives (CO)	1. To introduce the concepts and terminology of Data Transmission. 2. To understand concept of Data Encoding and Data Communication Interface. 3. To familiarize with Multiplexing, Switching Techniques, LAN Technologies. 4. To study and explore different Protocol Architectures, Error detection and correction techniques, MAC layer protocols, Channel access methods, Address resolution protocol and Ethernet technologies.
Course Outcome	

SYLLABUS

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SECTION-A

Data Transmission/The Physical Layer: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Guided Transmission Media, Wireless Transmission, Communication Satellites, The Public Switched Telephone Network, The Mobile Telephone System, Cable Television.

(5 hours)

Data Encoding: Digital Data: Digital and Analog Signals, Analog Data: Digital and Analog Signals, Spread Spectrum.

(3 hours)

Data Communication Interface: Asynchronous and Synchronous Transmission, Line Configurations, Interfacing.

(3 hours)

Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing.

(2 hours)

Circuit Packet and Switching: Switched Networks, Circuit-Switching Networks, Switching Concepts, Routing in Circuit-Switched Networks, Control Signaling, Packet-Switching Principles, Routing, Congestion Control, X.25.

(4 hours)

Frame Relay: Frame Relay Protocol Architecture, Frame Relay Call Control, User Data Transfer, Network Function, Congestion Control.

(3 hours)

LAN Technology and Systems: LAN Architecture, BusITree LANs, Ring LANs, Star LANs, Wireless LANs, Ethernet and Fast Ethernet (CSMA/CD), Token Ring and FDDI, 100VG-AnyLAN, ATM LANs, Fibre Channel, Wireless LANs, Bridge Operation, Routing with Bridges.

(6 hours)

SECTION-B

Protocols and Architecture: Protocols, OSI, TCP/IP Protocol Suite.

(3 hours)

Examples of networks: Arpanet, and Internet. Examples of Data Communication Services: X.25 Networks, Frame relay, Broad band ISDN and ATM. Physical Layer: Transmission media-Narrow band ISDN: Services-Architecture- Interface, Broad band ISDN and ATM- Virtual Circuits versus Circuit Switching –Transmission in ATM networks. FDDI.

(6 hours)

Link Layer and Local Area Networks Data link layer: Service provided by data link layer-Error detection and correction Techniques-Elementary data link layer protocols -Sliding Window protocols - Data link layer in HDLC, Internet and ATM . Multiple Access protocols: Channel partitioning protocols: TDM-FDM-Code Division Multiple Access(CDMA) .Random Access protocols : ALOHA, CSMA and CSMA/CD . Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches.

(10 hours)

TEXT BOOKS

S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Computer Networks	Andrew S. Tanenbaum	5th edition, Pearson Education,2011
2	Data Communications and Networking	Behrouz A. Forouzan	5th edition, 2015
3	Computer Networking	James F. Kurose and Keith W. Ross	International edition, Pearson Education 2012
4	Data and Computer Communication	William Stalling	10th edition, Pearson Education, 2013
5	Computer Networks and Internets	Douglas E Comer	6th edition, Pearson Education, 2014

Branch: Computer Science and Engineering

Course Code	CS 551
Course Title	**TECHNICAL WRITING AND COMMUNICATION SKILLS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. **Remedial Grammar:** Errors of accidence and syntax with reference to parts of speech; Agreement of subject and verb; Tense and Concord; Conditional clauses; Use of connectives in complex and compound sentences; Question tags and short responses.
2. **Vocabulary and Usage:** Word Formations (by adding suffixes and prefixes); Technical Word Formation; Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words; Phrasal Verb Idioms
3. **Technical Writing:**

A. Scientific Attitude and Impersonal Style; Plain Statements, Definitions; Description and Explanations (of objects, instruments, Processes, Scientific Principles, etc.) Summarizing and abstracting; Expressing ideas within a restricted word limit; Paragraph Writing (Paragraph division, introduction and the conclusion, Variety in sentences and paragraphs) Interpretation and use of charts, graphs and tables in technical writing. Punctuation

B. Reading at various speeds (slow, fast, very fast); reading different kinds of texts for different purpose (e.g. for relaxation, for information, for discussion at a later stage, etc.); reading between the lines. Comprehension of Unseen Passages

Branch: Computer Science and Engineering

Course Code	CS 502
Course Title	**COMPUTER GRAPHICS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	The course provides a comprehensive introduction to computer graphics leading to the ability to understand the terminology, progress, issues and trends in the area. The detailed coverage of graphics based algorithms enables the students to draw various geometric objects as well as to perform 2-D & 3-D transformations on them. This course further discusses the techniques for designing animation sequences and to achieve realism in rendering such as hidden surface elimination, shading.
Course Outcome	1.

SYLLABUS

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SECTION-A

Graphics Hardware:
Application areas of Computer Graphics, Overview of graphics systems, Video-display devices, Raster scan systems, Random scan systems, Graphics Input and Output devices.

(4 hours)

Output Primitives:
Points and Lines, Line Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Circle Generating Algorithm: Mid point circle algorithm, Ellipse Generating Algorithms: mid point ellipse algorithm, Pixel Addressing and Object Geometry, Boundary Fill Algorithms, Flood Fill Algorithms, Character Generation, Line, Area-Fill and Character Attributes.

(9 hours)

Two Dimensional Geometric Transformations and Viewing:
Basic Transformations: Translation, Rotation and Scaling, Matrix Representations, Composite Transformations, Viewing Pipeline, Window to Viewport Coordinate Transformation, Clipping Operations: Line, Polygon, Curve and Text Clipping.

(9 hours)

SECTION-B

Three Dimensional Concepts, Transformations and Viewing:
Three Dimensional Display Methods, Three Dimensional Transformations; Three Dimensional Viewing Pipeline; Viewing Coordinates; Specifying the View Plane, Projections: Parallel Projections, Perspective Projections.

(6 hours)

Splines and Curves:
Curved Lines and Surfaces, Spline Representations, Cubic Splines, Bezier Curves and their properties, B-Spline Curves.

(5 hours)

Visible Surface Detection Methods:
Classification of Visible Surface Detection Methods, Back Face Detection, Depth Buffer, A-Buffer, Scan Line and Depth-Sorting Methods, Wireframe Methods, Concepts of Computer Animation, Design of Animation Sequences.

(7 hours)

Illumination Models and Shading:
Light sources, Basic Illumination models, Shading models: Flat and Smooth Shading.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Computer Graphics C Version	. Donald Hearn, M.P. Baker	Second Edition, Pearson Education.
RECOMMENDED BOOKS			
1	Computer Graphics: principles and practice,	J. D. Foley, A. van Dam, S.K. Feiner, J.F. Hughes	Second Edition, Pearson Education
2	Computer Graphics	Z. Xiang, R.A. Plastock:,	Second Edition, Schaum's Outlines, Tata McGraw-Hill.
3	. N. Krishnamurthy	: Introduction to Computer Graphics	Tata McGraw-Hill.
4	Mathematical Elements for Computer Graphics,	David F. Rogers, James Alan Adams	Tata McGraw-Hill.
5	Computer Graphics: A Programming Approach	S. Harrington	Tata McGraw-Hill.

Branch: Computer Science and Engineering

Course Code	CS 552
Course Title	**COMPUTER GRAPHICS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Introduction to Borland Graphics Interface (BGI) and graphics libraries such as OPENGL, Cairo.
2. Implement DDA, Bresenham and midpoint line drawing algorithms.
3. Implement midpoint circle drawing algorithm.
4. Implement ellipse drawing algorithm.
5. Performing transformations in 2D space.
6. Performing 3D transformations.

Branch: Computer Science and Engineering

Course Code	CS 503
Course Title	**ARTIFICIAL INTELLIGENCE**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Discrete Structures (CS 303), Analysis and Design of Algorithms (CS 401)
Course Objectives (CO)	1. To introduce the AI techniques to solve problems and search strategies to find optimal solution paths from start to goal state. 2. To introduces different knowledge representation methods in AI Programs. 3. To introduce different design techniques for Game Playing Programs. 4. To introduce the AI Agents their design, planning and learning techniques. 5. To introduce the natural language processing and expert systems.
Course Outcome	1. Understand fundamental AI concepts and and identify a range of symbolic and non-symbolic AI techniques. 2. Demonstrate an understanding of various searching algorithms such as adversarial search and game-playing commonly used in artificial intelligence software. 3. Use different knowledge representation techniques used in AI Applications. 4. Demonstrate an understanding of agent-based AI architectures and an understanding of Planning and logic-based agents.

SYLLABUS

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SECTION-A

Introduction:
Artificial Intelligence and its applications, Artificial Intelligence Techniques, criteria of success.

(4 hours)

Problem solving techniques:

State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, AO* search, Constraint satisfaction problem, Agenda Driven Search, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Iterative Deepening.

(9 hours)

Knowledge representation:

Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts.

(8 hours)

SECTION-B

Non Monotonic and Statistical Reasoning

Non monotonic Logic, Default Logic, Circumscription, Bayes Theorem, Bayesian Network, Dempster Shafer Theory, Fuzzy sets, Fuzzy Logic, Defuzzification.

(8 hours)

Planning and Learning Agents:

Intelligent Agents, Nature and structure of Agents, Learning Agents, Introduction to different Forms of Learning,

The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

(9 hours)

Introduction to Learning and Expert system:

Expert systems, Expert system examples, Expert System Architectures, Rule base Expert systems, Non Monotonic Expert Systems, Decision tree base Expert Systems.

(7 hours)

TEXT BOOKS

S. No.	NAME	AUTHOR(S)	PUBLISHER
1.	AI: A Modern Approach	Stuart J. Russel, Peter Norvig	Pearson Education Latest Edition, 2012
2	Artificial Intelligence	Elaine Rich, Knight	McGraw Hill Third Edition2010
3	Artificial Intelligence,	Saroj Kaushik	Cengage Learning, First Edition2011
4	Artificial Intelligence,	Partick Henry Winston	Addison Wesley Latest Edition2012
5	Artificial Intelligence	George Luger	Pearson Education Latest Edition2010
6	Introduction to AI and Expert Systems, ,	DAN, W. Patterson	PHI Latest Edition2011
7	Principles of AI,	A.J. Nillson	Narosa publications Latest Edition, 2010

Branch: Computer Science and Engineering

Course Code	CS 553
Course Title	**ARTIFICIAL INTELLIGENCE (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Program Related to Problem Solving techniques of AI
   - Breadth First Search
   - Depth First Search
   - Heuristic Search
   - Best Search
   - Min-Max Search with alpha-beta pruning
   - Tic-Tac-Toe problem
   - N-Queens and N-Knight problem
   - Unification Algorithm
2. Introduction To AI Languages such as LISP, PROLOG
3. Representing Knowledge using RuleML
4. Using semantic Web
5. Knowledge of using Neural Networks, Fuzzy logic, genetic algorithms
6. Other new AI Techniques

Branch: Computer Science and Engineering

Course Code	CS 504
Course Title	**PRINCIPLES OF PROGRAMMING LANGUAGES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Programming Fundamentals(CS101/201)
Course Objectives (CO)	This course should provide the students with a fairly good concept of fundamental concepts and design issues of programming languages and become familiar with major programming paradigms. Understand similarities and differences between models and know when to use them and also learn programming techniques appropriate for each model.
Course Outcome	

SYLLABUS

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SECTION-A

Introduction:
Study of principles and major concepts in various programming paradigms like imperative, functional, object-oriented and logic programming. Introduction to various phases of compilers, Formal translation models: BNF Grammars.

(5 hours)

Imperative Programming:
Location, reference and expressions, assignment and control, data types, blocks, procedures and modules.

Object Oriented Programming:
Classes and objects, abstraction and encapsulation, inheritance, Polymorphism, virtual functions and classes, abstract classes. (7 hours)

Logic Programming:
Unification, SLD-resolution, Backtracking, Cuts.
Concepts Of Concurrent Programming: Processes, synchronization primitives.

(8 hours)

SECTION-B

Functional Programming:
Functions as first class objects, higher order functions, polymorphic data types, type checking and type inference.

(10 hours)

Storage Management:
Static storage management, Heap storage management.

(10 hours)

Illustration of the above concepts using representative languages: C++, Java, and Prolog etc.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Programming Languages: Design & Implementation	Prattt&Zelkowrtz,	Pearson Education 5th Edition
2	Essentials of Programming Languages,	Friedman, Wand, and Haynes	MIT Press 2001, ISBN 0262062178, 9780262062176 Latest Edition
3	Principles of Programming Languages: Design, Evaluation, and Implementation	Bruce J. MacLennan	Oxford University Press US, 1999, ISBN 0195113063, 9780195113068 Latest Edition

Branch: Computer Science and Engineering

Course Code	CS 505
Course Title	**THEORY OF COMPUTATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	This course will provide the in-depth knowledge of various computing models like Finite State Machine, Pushdown Automata and Turing machine..
Course Outcome	1.

SYLLABUS

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SECTION-A

Finite Automata:
Introduction: Basic mathematical notation and techniques, Finite Automata (FA), Deterministic Finite Automata (DFA), Non-deterministic Finite Automata (NFA), Finite Automata with Epsilon transitions.

(7 hours)

Regular Expression and Languages:
Regular Expression, Finite Automata and Regular Expressions, Regular and Non-regular languages, Closure properties of regular languages, Equivalence of Finite Automaton and regular expressions, Minimization of Automata, Pumping lemma for regular sets.

(7 hours)

Grammars and Languages:
Introduction, types of grammar, Context-free grammar, derivation and languages, ambiguity, Simplification of context-free grammars: Elimination of useless symbols, unit productions and Null productions, Normal Forms: Greibach normal form (GNF) and Chomsky normal form (CNF) .

(7 hours)

SECTION-B

Pushdown Automaton:
Pushdown Automaton: definition, moves, instantaneous descriptions, Deterministic Pushdown automaton, Equivalence of Pushdown automaton and Context free languages (CFL), Pumping lemma for CFL.

(8 hours)

Turing Machines:
Definitions of Turing Machines, models, computable languages and functions, Techniques for

Turing machine construction, Multi-head and Multi-tape Turing machines, The halting problem.

(8 hours)

Undecidability:

Unsolvable problems and computational functions, Recursive and recursively enumerable languages, Tractable and Intractable problems, P and NP completeness, Polynomial time reductions.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Introduction to Automata Theory, languages and computations	J. E. Hopcroft, R. Motwani, J. D. Ullman	Pearson Education 2nd Edition,2008
2	Introduction to languages and theory of computation	J. C. Martin	Tata McGraw Hill Publishing Company 2007
3.	Theory of Computer Science-Automata, Languages and Computation	K L P Mishra, N Chandrasekaran	Prentice Hall of India 3rd Edtion2004

Branch: Computer Science and Engineering

Course Code	CS 506
Course Title	**Principle of Designing**
Type of Course	Core
L T P	3 0 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. Conceptualisation and development of innovative, commercially important and socially sound decisions related to engineering products, processes and systems. 2. To train students to translate academic developments in electronics, computational, materials and energy engineering to real life applications of interest to industry for accelerated start of career.
Course Outcome	1. Develop and design engineering products that are commercially and socially viable. 2. Develop real-time applications using engineering design.

SYLLABUS

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SECTION-A

Introduction to designing

Fundamentals of engineering designs and applications; social, economic, sustainability, environmental and aesthetic rationales in design engineering, design decisions related to competitiveness of products, processes, services and systems. Impact of product design on business and market, product portfolio development through continuity in designing.

(7 hours)

Managing technologies and innovations

Technology road mapping, market and trend analyses for design decisions, managing technology and innovations, protecting designs by intellectual property rights, IPR gap analysis, creative thinking, technology sharing and transfer, founding start up companies, raising seed funding, challenges of conceiving, creating and growing a new venture.

(7 hours)

Design process

Principles, tools and strategies for conceptualising the need and presenting designs - product specifications, digital tools, analog drawings, design modeling: mathematical modeling, simulation using computers, and creation of 2D and 3D scale models. Engineering fundamentals related to mechanical, electrical, electronic and computational concepts in designing; environmental, sustainability, life cycle analysis, upstream manufacturing economics and downstream assembly, distribution, recyclability, robustness, maintenance and safety aspects in design development; functional prototypes, iterations, validation of product concept, product development .

(7 hours)

SECTION-B

Materials in Engineering Designs

Mechanical and structural properties of materials, application related needs, stress analysis and fracture, heat transfer, conductivity, transparency, surface properties etc. Nanomaterials, transparent ceramics, polymers, biocompatible materials, composites for biomechanical applications. Case studies through examples and minor projects on designing materials for dental restorative applications, energy harvesting technologies and transparent ceramics.

(8 hours)

Computational Designs

Theory and applications of computational design and manufacturing methods, use of tools like, computer aided design, computer aided engineering, computer aided manufacturing, Digital image capture and reconstruction, additive and subtractive manufacturing using CAD CAM, milling and 3D approaches. Examples by case studies and minor projects for designing prosthetics and orthosis.

(6 hours)

Challenges of Energy in Engineering Designs

Energy source, quality, costing, storage, utilisation, conservation and sustainability in engineering designs. Examples by case studies and minor projects on small energy capture, storage and management technologies.

(4 hours)

Smart Systems in Engineering Designs

Smart system technologies, real time sensing and communication, embedded intelligence, designing for internet of things, data acquisition and hardware interfacing and robotics. Case studies and minor projects related to devices for visually and hearing challenged individuals, traffic sensing and information analysis.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Design Thinking. 405 pages	Michael Luchs, Scott Swan, Abbie Griffin, 2015	1. John Wiley & Sons, Inc (ISBN 978-1-118-97180-2)
2	AProduct Design for Manufacture and Assembly..	Geoffrey Boothroyd, Peter Dewhurst	CRC Press
3.	Engineering Design Methods:	Nigel Cross, 2008	Strand Winston A Knight, 2011
4.	Strategies for Product Design		2. Wiley & Sons (ISBN 978-0-470-51926-4)
5.	Mechanical Engineering Design	Richard G Budynas and J Keith Nisbett, 2010	3. Mc Graw Hill (ISBN 978-0-07-352928-8).