EduTrace Knowledge Base

System Information

Name	EduTrace
Version	1.0
Description	Smart Question Categorization System for Educational Content
Purpose	Help students and educators find relevant course content based on natural language que

System Features

Smart Question Categorization

Description: Uses AI to match your questions with relevant course modules

How to use: Simply type your question about any topic, and the system will find the most relevant module

Syllabus Processing

Description: Upload and process PDF syllabi to extract course information

How to use: Upload a PDF syllabus file through the module detection page

YouTube Integration

Description: Get relevant YouTube video recommendations for matched modules

How to use: After asking a question, relevant YouTube videos will be displayed

Confidence Scoring

Description: See how confident the system is about its matches

How to use: Check the confidence scores displayed with each match

Frequently Asked Questions

Q: How do I upload a syllabus?

A: Go to the Module Detection page, click 'Choose File', select your PDF syllabus, and click 'Upload'

Q: What types of questions can I ask?

A: You can ask any question related to your course content. The system will find the most relevant module

Q: How accurate is the system?

A: The system uses AI to provide accurate matches. You'll see confidence scores to indicate match quality

Q: Can I see my previous questions?

A: Currently, the system processes questions in real-time and doesn't store history

Q: What if my question doesn't match any module?

A: The system will indicate 'Out of Syllabus' if no relevant match is found

User Guide

Getting Started

• 1. Upload your syllabus PDF

• 2. Wait for processing to complete

• 3. Start asking questions about course content

• 4. View matched modules and YouTube recommendations

Best Practices

• Be specific in your questions

• Use natural language

• Focus on course-related topics

• Check confidence scores for match quality

Troubleshooting

• If upload fails, check PDF format

• For no matches, try rephrasing your question

• If videos don't load, check your internet connection

• Contact support if issues persist

Subject-Specific Keywords

System Programming and Compiler Construction

Macro processor, Assembly scheme, Finite State Automata, Concept of System Software, Semantic Analysis, Features of Macro facility, Design of Lexical analyzer, Relocating loader, Goals of system software, Data structures used in macro processor, Data structures used in assembler, Lexical Analysis, Basic block, Syntax Analysis, Macro definition and call, Loader, Bottom up parser - SR Parser, Three address codes, Relocation and Linking concept, Introduction to compilers, Design of code generator, Elements of Assembly Language programming, Dynamic loading, Phases of compilers, Operator precedence parser, Linker, Intermediate Code Generation, Nested macros, Syntax directed definitions, SLR parser, Triples, Interpreter, Direct Linking Loader, Functions of loaders, Flow graph, Compiler, Postfix notation, Debuggers, Simple macros, Single pass Assembler Design for X86 processor, Code Generation, Assembler, Dynamic linking, Editors, Operating system, Code Optimization, Machine Dependent optimization, System program and system programming, Syntax tree, Quadruples, Conditional macros, Machine Independent optimization, Indirect triple, Code generation algorithm, Design of Two pass macro processor, Two pass assembler Design, Context Free Grammar, Top down parser - LL(1), Assembler Design, Device Drivers, Parameterized macros, Pass structure of assembler

Cryptography & System Security

Attacks on Digital Signature, Triple DES, Firewalls, Modular Arithmetic, Block cipher modes of operation, Symmetric Key Distribution, RSA Cryptosystem, Classical Encryption techniques, Kerberos Authentication protocol, Transposition techniques, Buffer Overflow, Worms and Viruses, Malicious Programs, Distributed Denial of Service, Keyed and keyless transposition ciphers, Challenge Response Based Authentication, Needham-Schroeder protocol, SSL, User Authentication, Cryptographic hash functions, Entity Authentication, Services and Mechanisms, Mono-alphabetic substitution, Network Attacks, Public key cryptography, KDC, RC4 algorithm, DES, Digital Signature Scheme - RSA, TCP/IP vulnerabilities, CMAC, UDP flood, Packet Sniffing, SYN flood, ARP spoofing, Euclidean Algorithm, SHA-1, HMAC, IDS, IP spoofing, MD5, Attacks, Fermat's Theorem, Euler's Theorem, Vigenere cipher, Playfair cipher, Double DES, ICMP flood, PKI, DOS attacks, Symmetric cipher model, PGP, IPSEC, Security Goals, Knapsack cryptosystem, Digital Signature, SQL injection, Properties of secure hash function, Advanced Encryption Standard (AES), Password Based Authentication, Block cipher principles, Hill cipher, Polyalphabetic substitution, Port scanning, Digital Certificate - X.509, Symmetric key agreement - Diffie Hellman, MAC

Mobile Computing

Registration, Wireless LAN Threats, EPS: Evolved Packet System, UMTS core network, Snooping TCP, LTE/SAE Requirements, Introduction to 5G, Handover, Signal Propagation, Fast Retransmit / Fast Recovery, Radio interface, Mobility Management: Introduction, Protocol stack, Cellular systems, System Architecture, b, Macro Mobility: MIPv6, FMIPv6, Protocol architecture, Comparison between 2G, 3G, 4G and 5G, GSM Mobile services, a, Voice over LTE (VoLTE), Telecommunication Generations, SON for Heterogeneous Networks (HetNet), Tunneling and Encapsulation, Agent Advertisement and Discovery, IP Mobility, Security (A3, A5 & A8), Mobile IP: IP Packet Delivery, Introduction to LTE-Advanced, Mobile TCP, Traditional TCP, Introduction to Mobile Computing, Protocols, Bluetooth: Introduction, MAC management, Securing Wireless Networks, Co-channel interference, Transmission / Timeout Freezing, LTE System Overview, SAE Architecture, E-UTRAN, Electromagnetic Spectrum, Improvements on Core Network, Internet Protocol and Transport layer, Optimization, IEEE 802.11: System architecture, Reverse Tunneling, Multiplexing, Signal Characteristics, Selective Retransmission, Introduction to WLANs, IPv6, GPRS system and protocol architecture, Medium Access Protocol, Localization and Calling, Infrastructure and ad-hoc network, UTRAN, Evolution from UMTS to LTE, User Scenario, MAC layer, Architecture, Spread Spectrum: DSSS & FHSS, Indirect TCP, Micro Mobility: CellularIP, HAWAII, HMIPv6, Physical layer, Antenna, Self Organizing Network (SON-LTE), Wi-Fi security: WEP, WPA

Artificial Intelligence

The nature of environment, The concept of rationality, Alpha Beta Pruning, Theory of Learning, Introduction to NLP - Language Models, Grammars, Parsing, Local Search Algorithms and Optimization Problems: Hill Climbing Search, Introduction to Reinforcement Learning, Robotics - Robots, Robot Hardware, Problems Robotics Can Solve, Foundations of AI, Partial Order Planning, Planning with State Space Search, Depth First Iterative Deepening (DFID), Passive Reinforcement Learning, Current trends in AI, A* Search, Representing Knowledge in an Uncertain Domain, Depth First Search (DFS), Memory Bounded Heuristic Search, PAC Learning, Intelligent Systems: Categorization of Intelligent System, Sub-areas of AI, Solving problem by Searching: Problem Solving Agent, Overview of Propositional Logic, Knowledge Engineering in First-Order Logic, Agents and Environments, Semantics of Belief Network, Simple Inference in Belief Network, Components of AI Program, First Order Logic: Syntax and Semantic, The Planning Problem, Learning from Rewards, Applications of AI, History of Artificial Intelligence, Types of Agents, Knowledge Based Agents, Adversarial Search: Game Playing, Introduction to Statistical Learning, Inference in FOL, Active Reinforcement Learning, Backward Chaining, Informed Search Methods: Greedy Best First Search, Simulated Annealing, Depth Limited Search, Uninformed Search Methods: Breadth First Search (BFS), Formulating Problems, Forward Chaining, Example Problems, Conditional Planning, Resolution, Unification, Min-Max Search, Hierarchical Planning, Learning Agent, Introduction, Genetic Algorithms, Uncertain Knowledge and Reasoning: Uncertainty, The structure of Agents, Learning: Forms of Learning, AI Applications in Healthcare, Retail, Banking

Internet of Things

Cities – Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Comparison of IoT boards and platforms: computing, development

environments, communication standards, connectivity, Industry – Machine Diagnostics, Air Quality Monitoring, What is IoT? - IoT and Digitization, IoT Hardware - Arduino, Raspberry Pi, ESP32, Cloudbit, Particle Photon, Beaglebone Black, IoT Data Management and Compute Stack – Design considerations and Data related problems, Fog Computing, Edge Computing, The Hierarchy of Edge, Fog and Cloud, The oneM2M IoT Standardized Architecture, Convergence of IT and OT, IoT Challenges, Application Layer Protocol Not Present, Environment – Weather Monitoring, Air & Noise Pollution, Forest Fire, River Flood Detection, The Transport Layer, IoT Impact – Connected Roadways, Connected Factory, Smart Connected Buildings, Smart Creatures, Home Automation – Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Retail – Inventory, Smart Payments, Vending Machines, Smart Object – Definition, Characteristics and Trends, Actuators – Definition, Principles, Classifications, Types, Characteristics and Specifications, Layer 1 – Things: Sensors and Actuators Layer, SCADA - Background, Adapting SCADA for IP, Tunneling, Protocol Translation, Transport over LLNs, Energy – Smart Grids, Renewable Energy, Prognostics, IoT Application Layer Protocols – CoAP and MQTT, Sensor Networks – Architecture of Wireless Sensor Network, Network Topologies, Logistics – Route Generation, Fleet Tracking, Shipment Monitoring, Agriculture – Smart Irrigation, Green House Control, Health & Lifestyle – Health & Fitness Monitoring, Wearables, Layer 2 – Communications Network Layer, including Access Network, Gateways, Network Transport, IoT Network Management, IoT Application Transport Methods, Sensors/Transducers – Definition, Principles, Classifications, Types, Characteristics and Specifications, Enabling IoT Technologies - RFID, MEMS, NFC, BLE, LTE-A, IEEE 802.15.4, ZigBee, Layer 3 – Applications and Analytics Layer, Analytics Vs. Control Applications, Data Vs. Network Analytics, Smart Services, The IoT World Forum (IoTWF) Standardized Architecture, Comparison of IoT software platforms, Generic Web-Based Protocols, IoT Software - languages for hardware, middleware, API development, front ends, REST, JSON-LD

Digital Signal & Image Processing

Properties of DFT, DFT Computation using Properties, Sharpening Filters: High Pass, High Boost, Median Filter, Representation of Digital Image, Connectivity, DIT-FFT Flow Graphs, Inverse FFT, Classification of DT Signals and Systems, Need of FFT, Radix-2 DIT-FFT, Smoothing Filters: Low Pass, Intro to Digital Image, Sampling and Quantization, Spectral Analysis using FFT, Image File Formats: BMP, TIFF, JPEG, Gray Level Transformations, Zero Memory Operations, Linear & Circular Convolution, Auto/Cross Correlation, LTI systems, Output via Convolution, Edge Detection: Robert, Prewitt, Sobel, Laplacian, Histogram Processing, Equalization, Region-based Segmentation: Region Growing, Splitting, Merging, DTFT, DFT, IDFT, Relations, Neighborhood Processing, Image Averaging, Subtraction, Fundamentals, Segmentation on Discontinuities & Similarities, Convolution of Long Sequences, Intro to 2D DFT, Intro to DSP, Sampling & Reconstruction, Standard DT Signals, Signal Manipulations

Quantitative Analysis

Statistical data – Classification, Tabulation, Diagrammatic & Graphic representation of data, Types of errors, Method of moments and method of maximum likelihood, Random sample - Parametric point estimation: unbiasedness and consistency, Primary & Secondary data, Sources of data, Methods of collecting data, Testing Significance, overall significance of fit of the model, Mathematical and Statistical Equation – Meaning of Intercept and Slope – Error term – Measure for Model Fit – R^2 – MAE – MAPE, Null and Alternative hypotheses, Sampling – Census & Sample methods – Methods of sampling, Probability Sampling and

Non-Probability Sampling, Multiple Linear Regression Model, Partial Regression Coefficients, Testing for Individual Regression Coefficients, Functions – Importance – Uses and Limitations of Statistics, Neyman-Pearson lemma - MP and UMP tests

Probabilistic Graphical Models

Context Specific CPDs, Continuous Spaces, Directed Graph Model: Bayesian Network-Exploiting Independence Properties, Basic Concepts in Probability, Hidden Markov Model, Application of HMM: Speech Recognition, Application of Bayesian Networks: Classification, Structured Decision Problems: Decision Tree, Paths and Trails, Bayesian Network Semantics, Learning as Optimization: Empirical Risk, Local Probabilistic Models: Tabular CPDs, Conditioning, From Distributions to Graphs, Parameter Estimation: Maximum Likelihood Estimation, Utilities and Decisions: Maximizing Expected Utility, Specific Prediction Tasks, Relational Markov Model and its Applications, Learning Graphical Models: Goals of Learning, Introduction to Probability Theory, Undirected Graph Model : Markov Model-Markov Network, Application of Markov Models: Cost Effectiveness Analysis, Introduction to Graphs: Nodes and Edges, Markov Network Independencies, Exact inference variable elimination: Analysis of Complexity, Generalized Linear Models, Basic Independencies in Bayesian Networks, Deterministic CPDs, Decision Making, Over Parameterization, Learning Tasks, Random Variables and Joint Distribution, Markov Model, Picking Structure, Selecting a Learning Procedure, Naive Bayes Model, Introduction to Probabilistic Graph Models: Bayesian Network, Overfitting, Directed Probabilistic Models, Subgraphs, Bayesian Network Model, Structural Uncertainty, Learning Causal Models, MLE for Bayesian Networks, Parameterization of Markov Network, Forecasting, Picking Probabilities, Applications of PGM, Template Variables and Template Factors, Reduced Markov Network, Exact inference variable elimination: Graph Theoretic Analysis for Variable Elimination, Correlation and Causation, Utility Elicitation, Template Based Graph Model : HMM- Temporal Models, Goodness of fit, Variable Elimination, D-separation, Expectation and Variances, Gibb's distribution, Utility Curves, Undirected Representation, Part of Speech Tagging, Application in Portfolio Optimization, Bioinformatics, Structural Causal Identifiability, Inference with Structured CPDs, Fine Grained Parameterization, Mechanisms and Response Variables, Reasoning Patterns, Causal Models, Density Estimation, Graphs and Distributions. Modelling: Picking variables, Cycles and Loops, Causality: Conditioning and Intervention, Independence and Conditional Independence, Evaluating Generalization Performance, Generalization, Knowledge Discovery

Advanced Database Management System

Models, Basic operations with MongoDB shell, Distribution Models Consistency in distributed data, Consistency, Availability, Advanced queries using logical operators and sorting, CAP theorem, Simple aggregate functions, Querying MongoDB using find() functions, Distributed Concurrency Control - Taxonomy, Replication and sharding, Locking based, Spatial database: Introduction, Handling Transactions, XML Vs JSON, MongoDB Distributed environment: Concepts of replication and horizontal scaling through sharding in MongoDB, Operators and queries, Types of NoSQL databases: Key-value data store, Comparison between SQL and NoSQL database system, Querying, XML Databases: Document Type Definition, Basic Data Types, Temporal database: Concepts, Distributed Query Processing - Characterization of Query Processors, Stringifying and parsing the JSON for sending & receiving, Time representation, Time dimension, Case Study Neo4J, Embedded Documents, Data types, Arrays, Basic JSON syntax (JavaScript Object Notation), Comparison of NoSQL databases w.r.t CAP theorem and ACID properties, Consistency and eventual consistency, Transactions,

JSON data types, Querying and Transformation: XPath and XQuery, Data Fragmentation, XML Schema, Recovery in Distributed Databases: Failures in distributed database, Distributed DBMS Architecture, NoSQL using MongoDB: Introduction to MongoDB Shell, MongoDB client, Layers/ phases of query processing, Incorporating time in relational databases, PC and 3PC protocol, Notion of ACID Vs BASE, Features, Distributed Transaction Management – Definition, properties, types, architecture, Benefits of NoSQL, Introduction, Graph Database: Introduction, Document database and Column Family Data store, Running the MongoDB shell, Basic TO algorithm, Replication and Allocation Techniques for Distributed Database Design, Saving and updating document, JSON Object retrieval using key-value pair and JQuery, NoSQL database concepts: NoSQL data modeling

Internet Programming

Java Script, Validation, HTTP Response Message, Exception Handling, Control structures, Inheritance, Rich User Interface using Ajax, JavaScript DOM Model, Basics of Bootstrap, Data types, Drag and Drop, Servlet Life Cycle, Tracking users, Clients, Servers and Communication, XML Schema, PHP and MySQL database connectivity with example, Web Servers, Understanding Java Server Pages, HTML5 – fundamental syntax and semantics, Simple Application using JSX, JSP Standard Tag Library (JSTL), Characteristics of RIA, Servlets, Introduction to JSX, Building web applications using PHP, Using XML Parsers: DOM and SAX, Image, Transformations, DHTML with JavaScript, Regular Expressions, AJAX vs Traditional Approach, Basic Internet protocols, Semantic elements, Web Clients, Date and Objects, Document Object Model, Animation, XSL - eXtensible Stylesheet Language, Audio, React features, Backgrounds, Transitions, Creating HTML forms by embedding JSP code, Form GET and POST actions, World wide web, Border Images, HTTP Request Message, Lists, App 'Hello World' Application, JDBC perspectives, Syntax, JDBC program example, Shadows, jQuery framework with AJAX, An introduction to JavaScript, Text, Installing and Configuring Apache Tomcat Web Server, JSON introduction, Understanding Cookies, HTML5 control elements, Event Handling, Introduction to PHP, Introduction, SQL, Video controls, Tables, Colors, Database Connectivity, JSP, Built in functions, Java Servlet Architecture, Built-in objects, Function Files, The Internet, AJAX design basics, Web Essentials, Introduction to AJAX, XML – DTD (Document Type Definition), Presenting XML, CSS3 – Inline, embedded and external style sheets – Rule cascading, Http Request, Session Handling

Data Warehousing and Mining

Context Specific CPDs, Continuous Spaces, Analysis of Complexity, Basic Concepts in Probability, Hidden Markov Model, Modelling, Paths and Trails, Bayesian Network Semantics, Gibbs distribution, Exact inference variable elimination, Speech Recognition, Tabular CPDs, Conditioning, Goals of Learning, From Distributions to Graphs, Specific Prediction Tasks, Relational Markov Model and its Applications, Introduction to Probability Theory, Graph Theoretic Analysis for Variable Elimination, Maximizing Expected Utility, Parameter Estimation, Causality, Markov Network Independencies, Generalized Linear Models, Learning as Optimization, Directed Graph Model, Basic Independencies in Bayesian Networks, Deterministic CPDs, Decision Making, Over Parameterization, Local Probabilistic Models, Learning Tasks, Random Variables and Joint Distribution, Markov Model, Picking Structure, Markov Network, Selecting a Learning Procedure, Naive Bayes Model, Overfitting, Directed Probabilistic Models, Subgraphs, Application of Bayesian Networks, Maximum Likelihood Estimation, Structural Uncertainty, Learning Causal Models, MLE for Bayesian Networks, Parameterization of Markov Network, Undirected Graph Model, Forecasting, Application of

Markov Models, Bayesian Network, Picking Probabilities, Applications of PGM, Template Variables and Template Factors, Reduced Markov Network, Decision Tree, Correlation and Causation, Utility Elicitation, Goodness of fit, Learning Graphical Models, Nodes and Edges, Variable Elimination, D-separation, Picking variables, Expectation and Variances, Template Based Graph Model, Utility Curves, Classification, Undirected Representation, Part of Speech Tagging, Application in Portfolio Optimization, Bioinformatics, Structural Causal Identifiability, Inference with Structured CPDs, Fine Grained Parameterization, Utilities and Decisions, Cost Effectiveness Analysis, Mechanisms and Response Variables, Reasoning Patterns, Application of HMM, Causal Models, Density Estimation, Conditioning and Intervention, Bayesian Network-Exploiting Independence Properties, Introduction to Graphs, Cycles and Loops, Structured Decision Problems, Independence and Conditional Independence, Evaluating Generalization Performance, Generalization, Graphs and Distributions, Knowledge Discovery, Probability Theory, HMM- Temporal Models, Empirical Risk, Introduction to Probabilistic Graph Models

Computer Network

ICMP, DNS: Name Space, DLL Design Issues, Channel Allocation problem, Layer details of TCP/IP model, Stop and Wait, Go Back N, Fiber optics, CRC, Distance Vector Routing, Open loop congestion control, Congestion control algorithms, Network Address Translation (NAT), Checksum, IPv6, Aloha, Design issues for the layers, Elementary Data Link protocols, IPv4 Addressing, The Transport Service, Layer details of OSI model, Unicast, TCP Congestion Control, Resource Record, Leaky bucket algorithm, Services, Network application, Framing, UDP, Error Control, Multicast, Communication between layers, Network topology, FTP, Reference models, Shortest Path (Dijkstra's), QoS parameters, Classless addressing, Supernetting, IGMP, Closed loop congestion control, Token algorithm, TCP Flow control (sliding window), Transport service primitives, RARP, Connection management (Handshake), Link state routing, Hamming Code, Broadcast, HTTP, Electromagnetic Spectrum, Flow Control, Sliding Window, Introduction to computer network, TCP state transition, Carrier Sense Multiple Access (CSMA/CD), Twisted pair, Multiple access Protocol, Berkeley Sockets, DHCP, Coaxial cable, Interconnection networking devices, Network Layer design issues, Connectionless services, Network software and hardware components, Protocols - ARP, Guided Transmission Media, Error Detection and Correction, Routing algorithms, Communication Primitives, Protocol hierarchies, TCP timers, Medium Access Control sublayer, Telnet, SMTP, Connection-oriented services, IPv4 Protocol, Selective Repeat, Classful addressing, Slow Start, Types of Name Server, TCP, Subnetting, Introduction to Communication

Software Engineering

Requirement Modeling, Evolutionary Process Models, Re-Engineering, FP, Software Configuration Management (SCM), Validation testing, Monitoring and Management Plan (RMMM), Types of Software Maintenance, Risk Mitigation, Control structure testing, Capability Maturity Model (CMM), Software Requirement Specification document format (IEEE), Prescriptive Process Models, COCOMO II, Change Control, Data flow diagram, Cohesion and Coupling, Software Metrics, Spiral Process Model, Scrum, LOC, Project Scheduling & Tracking, Effective Modular Design, Requirement Engineering, Incremental Process Model, Equivalence testing, Scenario based model, Software Quality Assurance Metrics, Testing Techniques, Black-box testing, Risk Analysis & Management, Unit testing, Architectural design, Version Control, Extreme Programming (XP), Integration testing, Graph-based testing, Software Engineering-process framework, Design Principles &

Concepts, Software Project Estimation, RAD Process Model, System testing, Agile process model, Quality Concepts, Reverse Engineering, Waterfall Process Model, Advanced Trends in Software Engineering, Boundary Value testing, Basis path testing, Kanban, Software Reliability, Formal Technical Reviews, White-box testing

Theoretical Computer Science

Post Correspondence Problem, Equivalence of Left and Right linear grammar, Simplification and Applications, Context Free language (CFL), Context Free Grammars (CFG), Variants of TM, Universal TM, Equivalence between NFA with and without ε-transitions, Design of TM as generator, Arden's Theorem, Regular Grammar (RG), Definitions, Pumping lemma for RLs, Languages, Deterministic PDA, PDA as decider, Equivalence of RE and FA, Grammars and Chomsky hierarchy, Closure properties of RLs, Design of TM as decider, Language recognizers, Application of PDA, Halting Problem, Moore and Mealy machines, Applications and limitations of FA, Finite State machine (FSM), Multitrack TM, Transition diagrams, Regular Expression (RE), Alphabets, RE Applications, Finite Automata (FA), NFA to DFA Conversion, Normal Forms, Design of TM as acceptor, Power and Limitations of TMs, Regular Language (RL), Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA), Pumping lemma, Importance of TCS, Multitape TM, Decidability and Undecidability, Ambiguity, Leftmost and Rightmost derivations, Equivalence of RG and FA, Chomsky Normal Forms (CNF), Greibach Normal Forms (GNF), Closure properties, Language of PDA, PDA as acceptor of CFG, Recursively Enumerable Languages, Definition, PDA as generator, Minimization of DFA, Rice's Theorem, Sentential forms, Non-Deterministic PDA, Parse tree, Recursive Languages, FSM with output, Applications, Strings, Decision properties of RLs

Data Structures

index, rear, stack, node, first in first out, push, front, queue, enqueue, dequeue, doubly, last in first out, singly, linear, one-dimensional, circular, pointer, FIFO, array, LIFO, top, sequential, element, linked list, pop

Operating Systems

process, context switch, virtual memory, PCB, thread, paging, directory, scheduling, page fault, NTFS, file allocation, ext4, segmentation, swapping, memory, file, inode, multitasking, FAT

Computer Networks

subnet, OSPF, route, address, hop, encapsulation, protocol, IP, CIDR, IPv4, OSI, layer, mask, TCP/IP, router, metric, decapsulation, IPv6, BGP, RIP

Module-Specific Help

Introduction to System Software

Topics in Introduction to System Software include: Concept of System Software, Goals of system software, System program and system programming, Assembler, Macro processor...

Assemblers

Topics in Assemblers include: Elements of Assembly Language programming, Assembly scheme, Pass structure of assembler, Assembler Design, Two pass assembler Design...

Macros and Macro Processor

Topics in Macros and Macro Processor include: Macro definition and call, Features of Macro facility, Simple macros, Parameterized macros, Conditional macros...

Loaders and Linkers

Topics in Loaders and Linkers include: Functions of loaders, Relocation and Linking concept, Relocating loader, Direct Linking Loader, Dynamic linking...

Compilers: Analysis Phase

Topics in Compilers: Analysis Phase include: Introduction to compilers, Phases of compilers, Lexical Analysis, Finite State Automata, Design of Lexical analyzer...

Compilers: Synthesis Phase

Topics in Compilers: Synthesis Phase include: Intermediate Code Generation, Syntax tree, Postfix notation, Three address codes, Triples...

Introduction - Number Theory and Basic Cryptography

Topics in Introduction - Number Theory and Basic Cryptography include: Security Goals, Attacks, Services and Mechanisms, Modular Arithmetic, Euclidean Algorithm...

Symmetric and Asymmetric key Cryptography and key Management

Topics in Symmetric and Asymmetric key Cryptography and key Management include: Block cipher principles, Block cipher modes of operation, DES, Double DES, Triple DES...

Cryptographic Hash Functions

Topics in Cryptographic Hash Functions include: Cryptographic hash functions, Properties of secure hash function, MD5, SHA-1, MAC...

Authentication Protocols & Digital Signature Schemes

Topics in Authentication Protocols & Digital Signature Schemes include: User Authentication, Entity Authentication, Password Based Authentication, Challenge Response Based Authentication, Digital Signature...

Network Security and Applications

Topics in Network Security and Applications include: TCP/IP vulnerabilities, Network Attacks, Packet Sniffing, ARP spoofing, Port scanning...

System Security

Topics in System Security include: Buffer Overflow, Malicious Programs, Worms and Viruses, SQL injection...

Introduction to Mobile Computing

Topics in Introduction to Mobile Computing include: Introduction to Mobile Computing, Telecommunication Generations, Cellular systems, Electromagnetic Spectrum, Antenna...

GSM Mobile Services

Topics in GSM Mobile Services include: GSM Mobile services, System Architecture, Radio interface, Protocols, Localization and Calling...

Mobile Networking

Topics in Mobile Networking include: Medium Access Protocol, Internet Protocol and Transport layer, Mobile IP: IP Packet Delivery, Agent Advertisement and Discovery, Registration...

Wireless Local Area Networks

Topics in Wireless Local Area Networks include: Introduction to WLANs, Infrastructure and ad-hoc network, IEEE 802.11: System architecture, Protocol architecture, Physical layer...

Mobility Management

Topics in Mobility Management include: Mobility Management: Introduction, IP Mobility, Optimization, IPv6, Macro Mobility: MIPv6, FMIPv6...

Long-Term Evolution (LTE) of 3GPP

Topics in Long-Term Evolution (LTE) of 3GPP include: LTE System Overview, Evolution from UMTS to LTE, LTE/SAE Requirements, SAE Architecture, EPS: Evolved Packet System...

Introduction to Artificial Intelligence

Topics in Introduction to Artificial Intelligence include: Introduction, History of Artificial Intelligence, Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Foundations of AI...

Intelligent Agents

Topics in Intelligent Agents include: Agents and Environments, The concept of rationality, The nature of environment, The structure of Agents, Types of Agents...

Problem Solving

Topics in Problem Solving include: Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods: Greedy Best First Search...

Knowledge and Reasoning

Topics in Knowledge and Reasoning include: Knowledge Based Agents, Overview of Propositional Logic, First Order Logic: Syntax and Semantic, Inference in FOL, Forward Chaining...

Planning and Learning

Topics in Planning and Learning include: The Planning Problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning...

AI Applications

Topics in AI Applications include: Introduction to NLP - Language Models, Grammars, Parsing, Robotics - Robots, Robot Hardware, Problems Robotics Can Solve, AI Applications in Healthcare, Retail, Banking...

Introduction to Internet of Things (IoT)

Topics in Introduction to Internet of Things (IoT) include: What is IoT? - IoT and Digitization, IoT Impact – Connected Roadways, Connected Factory, Smart Connected Buildings, Smart Creatures, Convergence of IT and OT, IoT Challenges, The oneM2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture...

Things in IoT

Topics in Things in IoT include: Sensors/Transducers – Definition, Principles, Classifications, Types, Characteristics and Specifications, Actuators – Definition, Principles, Classifications, Types, Characteristics and Specifications, Smart Object – Definition, Characteristics and Trends, Sensor Networks – Architecture of Wireless Sensor Network, Network Topologies,

Enabling IoT Technologies - RFID, MEMS, NFC, BLE, LTE-A, IEEE 802.15.4, ZigBee...

The Core IoT Functional Stack

Topics in The Core IoT Functional Stack include: Layer 1 – Things: Sensors and Actuators Layer, Layer 2 – Communications Network Layer, including Access Network, Gateways, Network Transport, IoT Network Management, Layer 3 – Applications and Analytics Layer, Analytics Vs. Control Applications, Data Vs. Network Analytics, Smart Services...

Application Protocols for IoT

Topics in Application Protocols for IoT include: The Transport Layer, IoT Application Transport Methods, Application Layer Protocol Not Present, SCADA - Background, Adapting SCADA for IP, Tunneling, Protocol Translation, Transport over LLNs, Generic Web-Based Protocols...

Domain Specific IoTs

Topics in Domain Specific IoTs include: Home Automation – Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Cities – Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Environment – Weather Monitoring, Air & Noise Pollution, Forest Fire, River Flood Detection, Energy – Smart Grids, Renewable Energy, Prognostics, Retail – Inventory, Smart Payments, Vending Machines...

Create your own IoT

Topics in Create your own IoT include: IoT Hardware - Arduino, Raspberry Pi, ESP32, Cloudbit, Particle Photon, Beaglebone Black, IoT Software - languages for hardware, middleware, API development, front ends, REST, JSON-LD, Comparison of IoT boards and platforms: computing, development environments, communication standards, connectivity, Comparison of IoT software platforms...

Discrete-Time Signal and Discrete-Time System

Topics in Discrete-Time Signal and Discrete-Time System include: Intro to DSP, Sampling & Reconstruction, Standard DT Signals, Signal Manipulations, Classification of DT Signals and Systems, Linear & Circular Convolution, Auto/Cross Correlation, LTI systems, Output via Convolution...

Discrete Fourier Transform

Topics in Discrete Fourier Transform include: DTFT, DFT, IDFT, Relations, Properties of DFT, DFT Computation using Properties, Convolution of Long Sequences, Intro to 2D DFT...

Fast Fourier Transform

Topics in Fast Fourier Transform include: Need of FFT, Radix-2 DIT-FFT, DIT-FFT Flow Graphs, Inverse FFT, Spectral Analysis using FFT...

Digital Image Fundamentals

Topics in Digital Image Fundamentals include: Intro to Digital Image, Sampling and Quantization, Representation of Digital Image, Connectivity, Image File Formats: BMP, TIFF, JPEG...

Image Enhancement in Spatial Domain

Topics in Image Enhancement in Spatial Domain include: Gray Level Transformations, Zero Memory Operations, Histogram Processing, Equalization, Neighborhood Processing, Image Averaging, Subtraction, Smoothing Filters: Low Pass, Sharpening Filters: High Pass, High Boost, Median Filter...

Image Segmentation

Topics in Image Segmentation include: Fundamentals, Segmentation on Discontinuities & Similarities, Edge Detection: Robert, Prewitt, Sobel, Laplacian, Region-based Segmentation: Region Growing, Splitting, Merging...

Introduction to Statistics

Topics in Introduction to Statistics include: Functions – Importance – Uses and Limitations of Statistics, Statistical data – Classification, Tabulation, Diagrammatic & Graphic representation of data...

Data Collection & Sampling Methods

Topics in Data Collection & Sampling Methods include: Primary & Secondary data, Sources of data, Methods of collecting data, Sampling – Census & Sample methods – Methods of sampling, Probability Sampling and Non-Probability Sampling...

Introduction to Regression

Topics in Introduction to Regression include: Mathematical and Statistical Equation – Meaning of Intercept and Slope – Error term – Measure for Model Fit – R^2 – MAE – MAPE...

Introduction to Multiple Linear Regression

Topics in Introduction to Multiple Linear Regression include: Multiple Linear Regression Model, Partial Regression Coefficients, Testing Significance, overall significance of fit of the model, Testing for Individual Regression Coefficients...

Statistical Inference

Topics in Statistical Inference include: Random sample - Parametric point estimation: unbiasedness and consistency, Method of moments and method of maximum likelihood...

Tests of Hypotheses

Topics in Tests of Hypotheses include: Null and Alternative hypotheses, Types of errors, Neyman-Pearson lemma - MP and UMP tests...

Introduction to Probabilistic Graphical Modeling

Topics in Introduction to Probabilistic Graphical Modeling include: Introduction to Probability Theory, Probability Theory, Basic Concepts in Probability, Random Variables and Joint Distribution, Independence and Conditional Independence...

Bayesian Network Model and Inference

Topics in Bayesian Network Model and Inference include: Directed Graph Model, Bayesian Network-Exploiting Independence Properties, Naive Bayes Model, Reasoning Patterns, Basic Independencies in Bayesian Networks...

Markov Network Model and Inference

Topics in Markov Network Model and Inference include: Undirected Graph Model, Markov Network, Parameterization of Markov Network, Gibbs distribution, Reduced Markov Network...

Hidden Markov Model and Inference

Topics in Hidden Markov Model and Inference include: Template Based Graph Model, HMM-Temporal Models, Template Variables and Template Factors, Directed Probabilistic Models, Undirected Representation...

Learning and Taking Actions and Decisions

Topics in Learning and Taking Actions and Decisions include: Learning Graphical Models, Goals of Learning, Density Estimation, Specific Prediction Tasks, Knowledge Discovery...

Applications

Topics in Applications include: Application of Bayesian Networks, Classification, Forecasting, Decision Making, Application of Markov Models...

Distributed Databases

Topics in Distributed Databases include: Introduction, Distributed DBMS Architecture, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design...

Distributed Database Handling

Topics in Distributed Database Handling include: Distributed Transaction Management – Definition, properties, types, architecture, Distributed Query Processing - Characterization of Query Processors, Layers/ phases of query processing, Distributed Concurrency Control - Taxonomy, Locking based...

Data Interoperability – XML and JSON

Topics in Data Interoperability – XML and JSON include: XML Databases: Document Type Definition, XML Schema, Querying and Transformation: XPath and XQuery, Basic JSON syntax (JavaScript Object Notation), JSON data types...

NoSQL Distribution Model

Topics in NoSQL Distribution Model include: NoSQL database concepts: NoSQL data modeling, Benefits of NoSQL, Comparison between SQL and NoSQL database system, Replication and sharding, Distribution Models Consistency in distributed data...

NoSQL using MongoDB

Topics in NoSQL using MongoDB include: NoSQL using MongoDB: Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types...

Trends in Advanced Databases

Topics in Trends in Advanced Databases include: Temporal database: Concepts, Time representation, Time dimension, Incorporating time in relational databases, Graph Database: Introduction...

Introduction to Web Technology

Topics in Introduction to Web Technology include: Web Essentials, Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web...

Front End Development

Topics in Front End Development include: Java Script, An introduction to JavaScript, JavaScript DOM Model, Date and Objects, Regular Expressions...

Back End Development

Topics in Back End Development include: Servlets, Java Servlet Architecture, Servlet Life Cycle, Form GET and POST actions, Session Handling...

Rich Internet Application (RIA)

Topics in Rich Internet Application (RIA) include: Characteristics of RIA, Introduction to AJAX, AJAX design basics, AJAX vs Traditional Approach, Rich User Interface using Ajax...

Web Extension: PHP and XML

Topics in Web Extension: PHP and XML include: XML – DTD (Document Type Definition), XML Schema, Document Object Model, Presenting XML, Using XML Parsers: DOM and SAX...

React js

Topics in React js include: Introduction, React features, App 'Hello World' Application, Introduction to JSX, Simple Application using JSX...

Introduction to Networking

Topics in Introduction to Networking include: Introduction to computer network, Network application, Network software and hardware components, Interconnection networking devices, Network topology...

Physical Layer

Topics in Physical Layer include: Introduction to Communication, Electromagnetic Spectrum, Guided Transmission Media, Twisted pair, Coaxial cable...

Data Link Layer

Topics in Data Link Layer include: DLL Design Issues, Services, Framing, Error Control, Flow Control...

Network Layer

Topics in Network Layer include: Network Layer design issues, Communication Primitives, Unicast, Multicast, Broadcast...

Transport Layer

Topics in Transport Layer include: The Transport Service, Transport service primitives, Berkeley Sockets, Connection management (Handshake), UDP...

Application Layer

Topics in Application Layer include: DNS: Name Space, Resource Record, Types of Name Server, HTTP, SMTP...

Introduction To Software Engineering and Process Models

Topics in Introduction To Software Engineering and Process Models include: Software Engineering-process framework, Capability Maturity Model (CMM), Advanced Trends in Software Engineering, Prescriptive Process Models, Waterfall Process Model...

Software Requirements Analysis and Modeling

Topics in Software Requirements Analysis and Modeling include: Requirement Engineering, Requirement Modeling, Data flow diagram, Scenario based model, Software Requirement Specification document format (IEEE)...

Software Estimation Metrics

Topics in Software Estimation Metrics include: Software Metrics, Software Project Estimation, LOC, FP, COCOMO II...

Software Design

Topics in Software Design include: Design Principles & Concepts, Effective Modular Design, Cohesion and Coupling, Architectural design...

Software Testing

Topics in Software Testing include: Unit testing, Integration testing, Validation testing, System testing, Testing Techniques...

Software Configuration Management, Quality Assurance and Maintenance

Topics in Software Configuration Management, Quality Assurance and Maintenance include: Risk Analysis & Management, Risk Mitigation, Monitoring and Management Plan (RMMM), Quality Concepts, Software Quality Assurance Metrics...

Basic Concepts and Finite Automata

Topics in Basic Concepts and Finite Automata include: Importance of TCS, Alphabets, Strings, Languages, Closure properties...

Regular Expressions and Languages

Topics in Regular Expressions and Languages include: Regular Expression (RE), Equivalence of RE and FA, Arden's Theorem, RE Applications, Regular Language (RL)...

Grammars

Topics in Grammars include: Grammars and Chomsky hierarchy, Regular Grammar (RG), Equivalence of Left and Right linear grammar, Equivalence of RG and FA, Context Free Grammars (CFG)...

Pushdown Automata (PDA)

Topics in Pushdown Automata (PDA) include: Definition, Language of PDA, PDA as generator, PDA as decider, PDA as acceptor of CFG...

Turing Machine (TM)

Topics in Turing Machine (TM) include: Definition, Design of TM as generator, Design of TM as decider, Design of TM as acceptor, Variants of TM...

Undecidability

Topics in Undecidability include: Decidability and Undecidability, Recursive Languages, Recursively Enumerable Languages, Halting Problem, Rice's Theorem...

Arrays

Topics in Arrays include: array, one-dimensional, linear, sequential, index...

Linked Lists

Topics in Linked Lists include: linked list, node, pointer, singly, doubly...

Stacks

Topics in Stacks include: stack, LIFO, push, pop, top...

Queues

Topics in Queues include: queue, FIFO, enqueue, dequeue, front...

Process Management

Topics in Process Management include: process, thread, scheduling, PCB, context switch...

Memory Management

Topics in Memory Management include: memory, paging, segmentation, virtual memory, page fault...

File Systems

Topics in File Systems include: file, directory, inode, FAT, NTFS...

Network Layers

Topics in Network Layers include: OSI, TCP/IP, layer, protocol, encapsulation...

IP Addressing

Topics in IP Addressing include: IP, IPv4, IPv6, subnet, mask...

Routing

Topics in Routing include: router, route, hop, metric, RIP...

Learning Resources

Videos

YouTube video recommendations are provided for matched modules

Textbooks

Refer to your course textbooks for detailed information

Practice

Try solving related problems to reinforce understanding

Discussion

Engage in discussions with peers and instructors

System Commands

help	Show this help message
features	List all system features
guide	Show user guide

faq	Show frequently asked questions
clear	Clear current conversation
about	Show system information

Error Messages

upload_error	Error uploading syllabus. Please check file format and try again.
processing_error	Error processing syllabus. Please ensure it's a valid PDF.
no_match	No relevant module found. Try rephrasing your question.
api_error	Error connecting to services. Please try again later.
invalid_syllabus	Invalid syllabus format. Please upload a valid syllabus PDF.