Course Objective:
1.
2.
3.

Course Outcome:
CO1:
CO2:
CO3:
CO4:

REGRESSION AND CORRELATION: Curve fitting, method of least squares - inferences based on the least squares estimator - correlation - curvilinear regression - multiple regression. (8+7)

STATISTICAL QUALITY CONTROL: Statistical process control – chance and assignable causes of quality variation, statistical basis of control charts - control charts for variables $\bar{x}$, R and s charts - control charts for attributes – p, np, c and u charts. (8+7)

ACCEPTANCE SAMPLING: Lot-by-Lot acceptance sampling for attributes – single sampling plans for attributes, double, multiple and sequential sampling plans, acceptance sampling by variables - chain sampling, continuous sampling, skip-lot sampling plans. (8+7)

RELIABILITY: Failure distribution - reliability function, mean time to failure, hazard rate function, bathtub curve, conditional reliability, constant failure rate model – exponential reliability function, failure models, time dependent failure models - Weibull and normal distributions - serial configuration, parallel configuration, combined series parallel systems, system structure function, minimal cuts and minimal paths, state dependent systems. (8+7)

Total L:32 +T: 28 = 60

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Course Objective:
1. To analyze the complexity of algorithms and understand parallel algorithms.
2. To use search trees, heaps, kd trees, graph algorithms, sets and hashing to solve problems.

Course Outcome:
CO1: Analyze the time complexity of algorithms and describe the working of parallel algorithms
CO2: Solve problems using tree structures
CO3: Solve problems using graphical structures
CO4: Solve problems using disjoint sets and describe the various hashing and collision resolution techniques


GRAPHS: Representation – Shortest path algorithms: Unweighted shortest path, Dijkstra’s algorithm, Graphs with negative edge costs, Acyclic graphs, All pairs shortest path – Network Flow problems – Activity Networks – DFS applications: Biconnectivity, Euler Circuits (10)

DISJOINT SETS AND HASHING: Disjoint Sets: Representation – Union and find operations - Hashing: Static hashing – Dynamic hashing - Overflow handling - Bloom filters - Locality sensitive hashing (10)

Total L: 45

REFERENCES:
Course Objective:
1. To impart knowledge in various database systems and their concepts for modern application development
2. To develop applications using NoSQL database

Course Outcome:
CO1: Describe relational database concepts and write queries in SQL
CO2: Understand query processing and apply optimization algorithms
CO3: Understand system implementation techniques and security in database
CO4: Explain NoSQL databases and explore Neo4J

RELATIONAL DATABASE: Relational database Design – ER Diagram, Extended ER Diagram, Reduction to relational schemas, Normalization- Functional Dependencies, Normal Forms, SQL (11+8)

QUERY OPTIMIZATION: Algorithms for Query Processing – external sorting, SELECT and JOIN operation, PROJECT and set operation, aggregate operation and OUTER JOINs, Heuristics of Query Optimization, Cost Based Query Optimization. (11+7)

TRANSACTION AND SECURITY: Properties of Transaction, Serializability, Concurrency Control – locking, timestamp, validation based protocols, Deadlock – prevention, detection, recovery, Database security – issues, access control. (12+7)

TRENDS IN DATABASE: Introduction to NoSQL databases - Key-Value Stores – Columnar Stores – Document Stores, Graph database - The Power of Graph Databases - Options for Storing Connected Data - Data Modeling with Graphs-Building a Graph Database Application - Case Study - Neo4J. (11+8)

Total L: 45 + T: 30=75

REFERENCES:
5. Ian Robinson, Jim Webber, Emil Eifrem, Graph Databases, , New Opportunities for Connected Data, O'Reilly Media, USA, 2015.

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Course Objective:
1. To understand why Python is a useful scripting language for developers and how to design and program Python applications.
2. To understand how server-side programming (PHP) works on the web and process data in a MySQL database.

Course Outcome:
**CO1**: Apply Python programs to illustrate concise and efficient algorithms
**CO2**: Implement methods and functions to improve readability of programs
**CO3**: Develop programs in PHP to solve any given problem.
**CO4**: Develop a PHP application with MySQL


**PYTHON PROGRAMMING**: Functions - Passing parameters to a Function - Variable Number of Arguments - Scope - Passing Functions to a Function - Mapping Functions in a Dictionary – Lambda - Modules - Standard Modules – sys – math – time - dir Function. Error Handling: Run Time Errors - Exception Model - Exception Hierarchy - Handling Multiple Exceptions - Data Streams - Access Modes Writing - Data to a File Reading - Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling IO Exceptions - Working with Directories. (7+7)

**BASICS OF PHP**: Introduction to Open Source Programming and Scripting Language PHP - Variables – data types – arrays – array functions - Control structures – String manipulation – anonymous function - File Handling and Data Storage - Working with Forms – development of applications using PHP with Mysql. (8+8)


**Total L:30 + T:30 = 60**

**REFERENCES**:

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Course Objective:
1. Understand characteristics of software engineering paradigms
2. Analyze and identify appropriate models for designing software systems.

Course Outcome:
CO1: Outline the significant role of software development in large scale software systems and identify suitable software process model for a project.
CO2: Apply suitable analysis modeling approaches for a software system.
CO3: Design and develop behavioural and structural models based on system requirements.
CO4: Apply appropriate methods for system design.


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18ZS51/18ZC51 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY 0 0 4 2

Course Objective:
1. To understand various advanced data structures and identify their strengths and weaknesses.
2. To identify and apply the suitable data structure for the given real world problem.

Course Outcome:
CO1: Use suitable data structures to design solution for real world problems
CO2: Develop, debug, test and document the designed solutions

The students will design, analyse and implement suitable data structures like Arrays, linked lists, stacks, queues, Search Trees, Heaps, kd Tree, Graph Algorithms, Sets, Hashing for real world problems.

Total P: 60

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18ZS81 ENGLISH FOR RESEARCH PAPER WRITING 0 0 4 0

Course Objective:
1. To learn the english language skills to write a good technical paper
2. To learn the structure and elements of a good research paper

Course Outcome:
CO1: Understand the usage of appropriate english words and phrases in preparing a technical report
CO2: Understand the meaning of the structure and various elements of a technical paper
CO3: Convert a project work into a publishable paper
CO4: Conduct a literature survey on a chosen topic and write a survey paper
Planning and preparation, word order, breaking up of long sentences, structuring paragraphs and sentences, being concise and removing redundancy, avoiding ambiguity and vagueness, clarifying who did what, highlighting the findings, hedging and criticising, paraphrasing and plagiarism. (15)

Sections of a paper - Abstract, introduction, review of the literature, methods, results and discussions, conclusions, acknowledgements, references and the final check. (10)

Key skills needed to write title, abstract, introduction, review of the literature, methods, results and discussions, and conclusions of a research paper. (20)

Use of appropriate phrases to ensure the research paper is as good as it could possibly be the first time submission. (15)

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Course Objective:
1. To analyze, design, and implement effective solutions for data-intensive applications.
2. To decide the algorithms and programming models for a data intensive application.

Course Outcome:
CO1: Describe big data infrastructure and characteristics.
CO2: Describe characteristics of NoSQL stores and study components of NoSQL platforms.
CO3: Use appropriate preprocessing, Correlation, regression to solve problems.
CO4: Apply clustering and classification techniques and time series concepts for forecasting.


STORAGE PLATFORMS: NoSQL – Key-value store - Hadoop Architecture – Map Reduce programming – Examples - Spark; Column-oriented stores – HBase architecture, Hive; Document stores – MongoDB architecture – examples ; Graph stores – Neo4j architecture – examples ; Realtime Processing – Storm


THEORY AND METHODS-II: Clustering – partitioning and hierarchical approaches – Classification – KNN, Decision trees, Naive Bayes, SVM- Time Series Analysis – ACF, AR, MA, ARMA, ARIMA – Stream Analysis

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18ZS07 SOFTWARE TESTING AND QUALITY ASSURANCE

Course Objective:
1. To present the concepts, techniques and metrics for quality assurance in software development and gain knowledge of techniques for managing of testing projects.
2. To work on software testing tool and get working experience on testing projects.

Course Outcome:
CO1: Comprehend the principles of testing and Apply software testing techniques and strategies for testing software systems.
CO2: Identify and use software test automation tools.
CO3: Understand and Apply the software testing tool selenium to test any application
CO4: Recall the importance of quality assurance and significance of measurement, metrics and standards in managing software quality.


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18ZS08 SOFTWARE ENGINEERING MANAGEMENT  
3 0 0 3

Course Objective:
1. To understand the various software processes, estimation models, risk levels in software development, risk plan, implementation and tracking risks.
2. To realize the importance of people management, software maintenance process, measurement and benchmarking

Course Outcome:
CO1: Comprehend software process management, people management and framework for productivity improvement.
CO2: Perform software estimation, Conduct feasibility study and develop project plan
CO3: Apply quantitative techniques to monitor software project.
CO4: Recall the importance of product management in a software organization and Summarize the issues in software maintenance.

SOFTWARE PROCESS AND PEOPLE MANAGEMENT:
- Process - Process Maturity
- Capability Maturity Model and its variants - CMMI
- PEOPLE MANAGEMENT:
  - Basic organization structures
  - Decision making
  - Issues in people management
  - Effective Team building
  - Organizational Behavior
  - Productivity improvement

SOFTWARE ESTIMATION AND FEASIBILITY STUDY:
- Components of Software Estimation
- Problems associated with estimation
- Estimation methods
  - Full Function Points – LOC Estimation
  - COCOMO II – Putnam Estimation Model
  - Cost Estimation
- Economical, Technical and Operational Feasibility studies.
- Discounted cash flow and return on investment
- Stepwise planning
- Identifying scope and objectives

PROJECT SCHEDULING AND TRACKING:
- Principles of project scheduling
- Critical Path
- Tracking methods
- Timeline chart
- Earned value Analysis
- RISK MANAGEMENT:
  - Nature, Type of Software Risks
  - Risk identification
  - Risk exposure
  - Risk prioritization
  - Risk Mitigation, Monitoring and Management plan

SOFTWARE CONFIGURATION MANAGEMENT AND MAINTENANCE:
- Need for Configuration Management
- check in check out process
- Versions and Variations – Baselines
- Software Configuration Audit
- Software Maintenance Process, Activities and Categories
- Maintenance Measurement
- Service Measurement and Benchmarking

REFERENCES:

CO - PO MAPPING
Course Objective:
1. To describe a software architecture using various documentation approaches and architectural description languages.
2. To motivate the architectural concerns for designing and evaluating a system's architecture.
3. To identify different structural patterns.

Course Outcome:
CO1: Describe the importance and role of software architecture in large scale software systems.
CO2: Identify and assess software architecture quality attributes.
CO3: Create UML views and describe the needs, concepts of aspect oriented architecture and MDA.
CO4: Describe and apply architectural styles and patterns.


ARCHITECTURAL STYLES AND PATTERNS: Patterns in Software Architecture – Layers, Pipes and Filters, Blackboard, Broker, MVC, Presentation – Abstraction - Control, other styles - event-based, data centred, interpreter, message dispatcher, multititer distributed - Adaptable Systems

REFERENCES:

CO - PO MAPPING
18ZS52/18ZC52 DATA INTENSIVE COMPUTING SYSTEMS LABORATORY

Course Objective:
1. Demonstrate an ability to use tools like MongoDB, Neo4J, Hadoop, R-tool to efficiently store retrieve and process Big Data.
2. Implement Several Data Intensive tasks using Map Reduce paradigm and R.

Course Outcome:
CO1: Use suitable framework to efficiently store, retrieve and process data intensive problems.
CO2: Develop, debug, test and document the designed solutions for data intensive problems.

The students will learn to use data intensive computing platforms like Hadoop, Spark, Hbase, MongoDB, Neo4j and R for techniques like MapReduce, Machine Learning, Data Visualization, Regression, Clustering, Association Rule Mining, Classification, Time Series Analysis etc and are then applied to solve a data intensive problem

Total P: 60

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18ZS61/18ZC61 INDUSTRY VISIT & TECHNICAL SEMINAR

Course Objective:
1. To provide an opportunity to the students to interact with industry people as well as to learn practically through interaction, working methods and employment practices.
2. To provide an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college.
Course Outcome:
CO1: Visit the relevant industries and gain knowledge about their process and functioning
CO2: Generate technical presentations to communicate complex, technical ideas to various types of audiences

The student will make at least two technical presentations on current topics related to the programme. The same will be assessed by a committee appointed by the department. The students are expected to submit a report at the end of the semester covering the various aspects of his/her presentation together with the observation in industry visits.

Total P: 60

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18AE82 RESEARCH METHODOLOGY AND IPR

Course Objective:
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Course Outcome:
CO1:
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CO4:

Meaning of research problem, sources of research problem, criteria and characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem, approaches of investigation of solutions for research problem, data collection, analysis and interpretation. (25)

Effective literature studies approaches, analysis of plagiarism, research ethics, effective technical writing, how to write report, developing a research proposal, format of research proposal, presentation of research proposal for assessment by a review committee. (20)

Nature of intellectual property: Patents, designs, trade and copyright. Process of patenting and development: Technological research, innovation, patenting, development, international cooperation on intellectual property, procedure for grants of patents, patenting under PCT. (20)

Patent rights: scope of patent rights, licensing and transfer of technology, patent information and databases, geographical indications. New developments in IPR: Administration of patent system, IPR of biological systems and computer software, traditional knowledge case studies on IPR. (25)

Total P: 90

REFERENCES:
SEMESTER III

18ZS53/18ZC53 SOFTWARE DEVELOPMENT LABORATORY

Course Objective:

1. To enable students to continue exposition of methods and tools of software development.
2. Provides an opportunity to apply and investigate theoretical and conceptual knowledge of software development.
3. To enable students to learn and practice the stages of software development.

Course Outcome:

Students will be able to

CO1: Prepare project plan, SRS, Design document, code document and test case documentations at appropriate stages of software development.
CO2: Acquire software development skills through various stages of software development.

The student will demonstrate the ability to design research methodology that adequately addresses the following:

❖ Idea generation and Concept Selection
   • Identification of real time problem in the field of computers.
   • Comparing and contrasting different types of research methods.
   • Patent search for foolproof concept selection
   • Time line of activities

❖ Design
   • Conceptualizing a research design and propose an innovative solution for the problem identified.

❖ Development and Testing
   • Model/prototype development
   • Validation and testing

Report submission and presentation

Total P: 60

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### 18ZS71/18ZC71 PROJECT WORK I

**Course Objective:**
1. Identify the real world problem and understand literature related to the problem
2. Develop a model to solve the problem and propose suitable solution.
3. Present and Document the work done by following ethical practices.

**Course Outcome:**
CO1: Identification of Problem, Conduct of Literature survey and Solution Generation, code development, interpretation of results by application of relevant knowledge and skill, Evaluation of results obtained.
CO2: Documentation and Presentation of the work done in the given structure and format.

- Identification of a real world problem.
- Conduct literature survey
- Formulate a solution for the problem based on literature survey.
- Implementation of the modules
- Compare the results with existing solutions
- Write a technical report on the work done
- Publish the work in reputed national / international conferences

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### SEVENTH SEMESTER

**18ZS72/18ZC72 PROJECT WORK II

**Course Objective:**
1. Identify the real world problem and understand literature related to the problem
2. Develop a model to solve the problem and propose suitable solution.
3. Present and Document the work done by following ethical practices.

**Course Outcome:**
CO1: Identification of Problem, Conduct of Literature survey and Solution Generation, code development, interpretation of results by application of relevant knowledge and skill, Evaluation of results obtained and performance analysis with existing methods.
CO2: Documentation and Presentation of the work done in the given structure and format.

- Problem Identification.
- Define the scope and objectives of the problem
- Develop a mathematical model with realistic assumptions.
- Propose a novel and original solution for the identified problem
- Implementation of the modules
- Interpretation and validation of results using formal research methods
- Comparison with existing solutions
- Publish the work in refereed national / international journals

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Total P: 420
ELECTIVE THEORY COURSES

18ZS21 USER INTERFACE DESIGN

Course Objective:
1. To learn about designing the user interfaces considering human and computer capabilities and constraints.
2. To understand the user-centered design and usability principles.
3. To Know about Web UI design principles.

Course Outcome:
CO1: Design user interfaces using task oriented approach.
CO2: Use the object oriented and CSCW approach to design and test the User Interfaces.
CO3: Demonstrate the approaches, techniques, and methods available to design, evaluate and test usability and understand the need of accessibility.
CO4: Describe characteristics and principles of Web UI.

**Object Oriented Design and CSCW UI:** Object Oriented UI Design: Design of Icons – Use of Metaphors – GUI Design – Case Study, CSCW Characteristics – Examples – CSCW UI – Method of Specifying and Designing UI for CSCW Systems – Case Study.


**Web Interface Design:** Designing Web Interfaces - Drag and Drop-Direct Selection-Contextual Tools, Overlays, Inlays and Virtual Tags - Process Flow - Case Studies

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**18ZS22/18ZC24 Agile Software Development**

**Course Objective:**
1. Learn the practices and values of Agile methods and compare them with other methodologies
2. Learn extreme programming methodology
3. Learn the practices in Scrum and apply them for IoT and bigdata projects using tools

**Course Outcome:**
CO1: Understand values and practices in Agile Methodology and compare agile method with traditional methods.
CO2: Understand extreme programming process model and apply it for a case study
CO3: Understand Scrum process model and apply it for a case study of IoT Projects and Big data Projects
CO4: Know and compare other agile methods like FDD, DSDM etc
AGILE PRINCIPLES AND MODELING: Introduction - Traditional, IID and Agile Methodologies – Comparison - Need - Manifesto – Values and Practices – Agile Modeling Values, principles and practices – Agile modeling with RUP (8+8)


Total L: 30 + T: 30 = 60

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18ZS23/18ZC25 INTERNET OF THINGS

Course Objective:
1.
2.
3.

Course Outcome:
CO1: CO2: CO3: CO4:


ELECTRONIC PROTOTYPING: Prototypes and Production - Open Source versus Closed Source - Prototyping Embedded Devices - Prototyping IoT Projects With Arduino - Prototyping IOT Projects With Raspberry PI

CASE STUDIES AND IOT DATA ANALYTICS: Real world design constraints - Applications - Asset management, Industry 4.0, Smart grid, Commercial building automation, Smart cities Data Analytics for IoT – Edge analytics - sensor data fusion techniques - Cloud Storage Models & Communication APIs - Cloud for IoT - Predictive analytics

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18ZS24/18ZC07 ADVANCED OPERATING SYSTEMS

Course Objective:
1. To understand and apply Process scheduling and process synchronization.
2. Be familiar with Distributed operating systems and resource management
3. To know about Real time and Mobile operating system

Course Outcome:
CO1: Apply process scheduling and synchronization concepts and also describe memory management techniques.
CO2: Analyze Mutual exclusion, Deadlock detection and agreement protocols in Distributed operating system.

CO3: Summarize various resource management techniques for distributed systems.

CO4: Illustrate different features of real time and mobile operating systems.


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18ZS25 PRIVACY PRESERVING DATA MINING

Course Objective:
1. To Learn the various concepts, metrics and data mining techniques related to privacy.
2. To Learn the various privacy preserving methods and privacy security models.
3. To Learn the different privacy preserving distributed data mining techniques.
Course Outcome:
CO1: Describe the concepts of privacy and data mining techniques associated with it.
CO2: Illustrate the metrics for privacy preservation and apply various privacy preserving methods.
CO3: Employ various privacy and security models.
CO4: Describe various privacy preserving distributed data mining techniques.

INTRODUCTION: Introduction to Data Mining : Data Mining Architecture, Data Preprocessing, Techniques: Association Rule mining – Classification and Prediction – Clustering Social Aspects of Privacy, Legal Aspects of Privacy and Privacy Regulations, Effect of Database and Data Mining technologies on privacy - Privacy issues, Need for PPDM - Applications of PPDM. (4+7)

QUANTIFICATION OF PRIVACY PRESERVING DATA MINING: Metrics for quantifying privacy levels, Metrics for quantifying Hiding failure, Metrics for quantifying Data Quality, Complexity metrics, Selecting a proper metrics, Utility based privacy preserving methods: Types, Anonymization using local recoding, Utility based privacy preservation in classification, Association rule mining. (6+8)


PRIVACY PRESERVING DISTRIBUTED DATA MINING: Basic cryptographic Techniques for Privacy Preserving Distributed Data Mining, Common Secure Sub - protocols used, Anonymization for vertically partitioned data and Horizontally partitioned data, Limitations of cryptographic techniques for privacy preserving data mining. Anonymizing Social Networks and Sanitizing Textual Data: Social Networks - Introduction, General Privacy Preservation Strategies, Anonymizing Networks. Textual Data: Introduction - ERASE - Health Information De-identification (HIDE) (10+5)

Total L: 30 + T: 30 = 60

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18ZS26 SOCIAL NETWORKS DATA ANALYTICS

Course Objective:
1. To impart knowledge in Social Network Models
2. Understand Node classification, Link Prediction in Social Networks
3. Learn various algorithms in social networks
Course Objective:
1. Gain knowledge in engineering complex systems using appropriate processes
2. Gain knowledge in implementing complex systems using methodical approach
Course Outcome:
CO1: Describe need and application of systems engineering considering structure of complex systems
CO2: Illustrate the system development and management process
CO3: Use concept development to analyze, explore and define concepts
CO4: Develop systems using systems engineering development processes and approaches

SYSTEMS ENGINEERING: Systems Engineering and Modern systems - Systems Engineering Landscape – Structure of complex systems (11)


CONCEPT DEVELOPMENT: Analysis – Concept Exploration – Concept Definition – Decision analysis and support (11)

ENGINEERING DEVELOPMENT: Advanced development: Requirements analysis, Risk analysis and reduction, Functional analysis, Prototype development, Software Systems Engineering, Engineering Design, Integration and evaluation (12)

Total L: 45

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18ZS28 SOFTWARE RELIABILITY

Course Objective:
1. Learn reliability modeling with respect to software products, using ODC for measuring software project, scope of fault tolerant software systems.

Course Outcome:
CO1: Comprehend the fundamental concepts of reliability and apply reliability measures, mathematical and probability concepts to address reliability issues.
CO2: Analyze system reliability models and design solutions for given problems using reliability models.
CO3: Describe and apply concepts of reliability prediction to solve given problems
CO4: Describe and apply concepts of redundancy techniques in real time environment to solve given problems


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Course Objective:
1. To provide a basic understanding and knowledge of the software metrics and measurement techniques.
2. To understand the importance of Metrics data collection and analysis for external product attributes and Resource measurement.
3. To obtain objective measurements that can be useful for quality assurance, debugging & estimating costs.

Course Outcome:
CO1: State importance of quantification in software engineering and Select software metrics based on project goals
CO2: Identify internal and external product attributes for measurement.
CO3: Identify the various techniques and models for effort, cost and time estimation
CO4: Discuss Plans to establish measurement programs in an organization


REFERENCES:

CO - PO MAPPING
18ZS30 DESIGN PATTERNS

Course Objective:
1. To solve problems related to software development using a proven solution
2. To develop a solution with high cohesive modules and minimal coupling

Course Outcome:
CO1: Describe solutions to programming problems using design patterns
CO2: Apply the patterns on responsibility patterns to solve problems
CO3: Apply the patterns on responsibility patterns to solve problems
CO4: Apply operation and extension patterns to solve problems

INTRODUCTION TO PATTERNS: Introduction to patterns – Describing Design Patterns, Relationship between Design Patterns, Solving Design Problems Using Patterns, Procedure to Apply and Use a Design Pattern (5)

INTERFACE PATTERNS: Introduction to interfaces – Adapter – Façade – Composite – Bridge pattern (7)


CONSTRUCTION PATTERNS: Introduction to construction - Builder, Factory Method, Abstract Factory, Prototype, Memento (11)

OPERATION & EXTENSION PATTERNS: Introduction to operations - Template, State, Strategy, Command – Extensions- Decorator, Iterator, Visitor (11)

Total L: 45

REFERENCES:
5. Kerievsky J, “Refactoring to Patterns”, Addison-Wesley Professional, Boston, MA, USA, 2004

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Course Objective:
1. To impart knowledge in Decision Support Systems Concepts, Methodologies And Technologies
2. To apply Intelligence for Decision Making

Course Outcome:
CO1: Describe the decision making models and Phases of Decision making
CO2: Appraise the decision support systems and management support system modeling
CO3: Recognize the role of Data mining in Business Intelligence (BI) and describe text mining
CO4: Illustrate Artificial Intelligence and Expert systems and their role in developing DSS

DECISION SUPPORT SYSTEMS (DSS) AND BUSINESS INTELLIGENCE (BI): Introduction to decision support systems - framework for business intelligence - tools and techniques for managerial decision support. Decision making Models - phases of decision making process - intelligence phase - design phase - implementation phase. (11)

DECISION SUPPORT SYSTEMS CONCEPTS, METHODOLOGIES AND TECHNOLOGIES: Decision support systems configuration and descriptions - characteristics and capabilities – classifications – components - data management subsystem - model management subsystem - user interface subsystem - the knowledge based management subsystem Modeling and analysis - Management support systems modeling - structure of mathematical models for decision support - certainty, uncertainty and risk.(11)

BUSINESS INTELLIGENCE: Data mining for business intelligence: data mining concepts and applications - data mining process and methods - Artificial Neural Networks for Data Mining applications of ANN - Case studies. Text and web mining: Text mining concepts - natural language processing - text mining applications and process - web mining overview. (11)


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Total L: 45
18ZS32 AGENT BASED INTELLIGENT SYSTEMS

Course Objective:
1. Understand the basics of agent based intelligent systems
2. Understand the role of knowledge and inference in agent based intelligent systems
3. Understand the basics and working of multi-agent intelligent systems

Course Outcome:
CO1: Describe and apply concepts of intelligent agents to problems in agent based intelligent systems
CO2: Describe and apply concepts of knowledge representation and inference to problems in agent based intelligent systems
CO3: Describe and apply concepts of uncertainty, probability and time to solve problems in agent based intelligent systems
CO4: Describe and apply concepts of multi-agent systems to solve problems in agent based intelligent systems


KNOWLEDGE REPRESENTATION: Knowledge Based Agents – Propositional Logic (PL) – First-Order Logic (FOL) – Inferences in PL and FOL – Semantic Net


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18ZS33/18ZC27 EVOLUTIONARY COMPUTING TECHNIQUES

Course Objective:
1. Comprehend the fundamental theories and approaches of Evolutionary Computing Techniques
2. Understand and use heuristic and meta-heuristics approaches for solving complex optimization problems and multi-objective optimization problems

Course Outcome:
CO1: Illustrate evolutionary computing techniques and heuristics search approaches for solving problems
CO2: Select and apply appropriate representation and variant of GA or DE to solve a given optimization problem
CO3: Select and apply appropriate representation and variant of PSO or ACO to solve a given optimization problem
CO4: Describe and apply NSGA for solving multi-objective optimization problems


SWARM INTELLIGENCE: Particle Swarm Optimization: Swarms, Operating principles, PSO Algorithm, Neighborhood Topologies - Variations of PSO: Binary, weighted - Ant Colony Optimization: Ant foraging behavior, Theoretical Considerations, ACO Algorithm, Variations of ACO: Elitist Ant System (EAS), MinMax Ant System (MMAS) and Rank Based Ant Colony System (RANKAS)

MULTI-OBJECTIVE OPTIMIZATION: Principles - Classical Methods - Challenges - Evolutionary algorithms for multi-objective optimization - Multimodal function optimization - Non-Dominated Sorting Genetic Algorithm (NSGA): Non-elitist, elitist - Controlled elitism in NSGA

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18ZS34 DATA INTEGRATION

Course Objective:
1. Apply design thinking and the Agile methodology to integrate data from various sources
2. Apply Data virtualization Techniques and Data Integration framework for Real-time data.

Course Outcome:
CO1: Represent and query information semantically
CO2: Describe and apply ETL for batch data integration and real-time data integration
CO3: Describe and apply data virtualization and schema mapping for integration
CO4: Describe and apply data integration in NoSQL systems


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18ZS36 PRIVACY IN SOCIAL NETWORKS

Course Objective:
1. Understand the risks and issues in maintaining privacy in social networks
2. Understand modeling and evaluation of privacy issues in various social networks using contemporary techniques

Course Outcome:
CO1: Describe the social network models, security and trust issues, and trust evaluation models
CO2: Explain privacy breach techniques, statistical methods for inferring information and privacy preservation strategy in MSN
CO3: Explain and apply of various algorithms in privacy preservation for social recommendations, profile matching, dynamic social networks, affiliation networks and peer to peer social networks
CO4: Model and evaluate and predict privacy issues in information sharing and privacy settings


PRIVACY BREACHES: Introduction – Types - Statistical methods for inferring information – Crowdsourcing and Ethics - Cooperative Data Forwarding Strategy with Privacy Preservation in MSN


MODELING, EVALUATING, AND MANAGING PRIVACY RISKS: Information-sharing Model - Strategic Behavior and Information sharing – issues - case study - Privacy-score Model - Methods for Computing the Privacy Score - Managing Privacy Settings - Predicting Users' Privacy Settings – Recommendation-Based Trustworthy Service Evaluation in MSN

Total L: 45

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18ZS37/18ZC41 MACHINE LEARNING

Course Objective:
1. Understand computational learning theory basics for different learning systems
2. Understand and design various linear and non-linear models for real world problems
3. Understand, Design a learning system and evaluate hypotheses based on computational learning theory

Course Outcome:
CO1: Understand linear models for regression and classification problems
CO2: Comprehend linear models for regression and classification problems
CO3: Understand and design neural networks for non-linear problems
CO4: Understand and design kernel and graphical models for real world problems

COMPUTATIONAL LEARNING THEORY BASICS:
- Types of Learning
- PAC Learnability
- Sample complexity for finite and infinite hypothesis spaces
- VC Dimension
- Evaluating Hypothesis
- Estimating Hypothesis Accuracy
- Bias-Variance
- Confidence Interval
- Central Limit Theorem

LINEAR MODELS:
- Linear Regression Models
- Maximum Likelihood Estimation
- Least Squares
- Bias-Variance Decomposition
- Bayesian Linear Regression
- Linear Models for Classification
- Probabilistic Discriminative Models
- Probabilistic Generative Models
- Linear Discriminant Analysis

NEURAL NETWORKS:
- Neural Networks
- Feed-forward Networks
- Network Training
- Delta Rule
- Gradient Descent
- Error Backpropagation
- Regularization in Neural Networks

KERNEL AND GRAPHICAL METHODS:
- Kernel Methods
- Constructing Kernels
- Radial Basis Function Networks
- Gaussian Processes
- Maximum Margin Classifiers
- SVM
- Graphical Methods
- Bayes Theorem
- Bayesian Networks
- Markov Random Fields
- Inference in Graphical Models
- Mixture Models
- Expectation Maximization

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