# Curriculum for UG & PG Programmes

## ( 2024-25 Onwards)

असतो मा सद्गमय

## Swami Keshvanand Institute of Technology, Management & Gramothan

**(An Autonomous Institute, Affiliated to Rajasthan Technical University, Kota)**
**(Accredited by NAAC with A ++ Grade)**
**Approved by AICTE, Ministry of Education, Government of India**
**Recognized by UGC under Section 2(f) of the UGC Act, 1956**

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| **Name of the Programme**: M.Tech. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Advanced Database Management Systems | **Course Code**: CSPL311 | **Credit**: 3 |
| **Max Marks:** 100 | **CIE:** 40 | **SEE:** 60 |
| **End Term Exam Time:** 3 Hrs | **Teaching Scheme:** 3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| 2 | **Physical Storage and Indexing Structures: Physical Storage**: Data Storage and Retrieval, File Organization: Heap, Sequential, and Hashed Files, Storage Structures: Blocks, Pages, and Records. **Indexing Structures:** Types of Indexes: Primary, Secondary, Clustered, and Non-clustered Indexes, B-Trees and B+ Trees, Bitmap Indexes and Hash Indexes, Index Maintenance and Optimization | 9 |
| 3 | **Query Processing and Optimization:** Steps in Query processing, Query Execution Plans: Cost Estimation and Cardinality Estimation, **Query Optimization Techniques, Issues,** Query Rewrite Techniques, System Catalogue. | 8 |
| 4 | **Transaction Management and Concurrency Control: Transaction Management**: ACID Properties of Transactions, Serializability and Transaction Isolation Levels, **Concurrency Control**: Locking Mechanisms: Two-Phase Locking, Deadlock Detection and Resolution, Optimistic Concurrency Control, Timestamp-Based Protocols, **Recovery**: Recovery Techniques: Log-Based Recovery, Shadow Paging, and Checkpointing, Distributed Transaction Management and Consistency Models | 11 |
| 5 | **Parallel and Distributed Databases: Parallel Databases**: Architectures of Parallel Databases, Data Partitioning and Load Balancing, Parallel Query Processing Techniques, **Distributed Databases**: Distributed Database Architectures and Design, Data Distribution Strategies: Replication and Fragmentation, Distributed Query Processing and Optimization, Consistency Models in Distributed Systems | 9 |
| 6 | **MongoDB:** Data Model and Structure: Documents, Collections, and JSON, CRUD Operations in MongoDB | 7 |
| | Total | **45** |

**Text Books:**


1. A. Silberschatz, H. Korth, and S. Sudarshan, *Database System Concepts*, 7th ed. New York, NY, USA: McGraw-Hill, 2020.
2. R. Elmasri and S. B. Navathe, *Fundamentals of Database Systems*, 7th ed. Boston, MA, USA: Pearson, 2016.
3. H. Garcia-Molina, J. D. Ullman, and J. Widom, *Database Systems: The Complete Book*, 2nd ed. Upper Saddle River, NJ, USA: Prentice Hall, 2008.
4. S. A. A. Khan, *MongoDB: The Definitive Guide*, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2022.


**Reference Books:**


1. M. Stonebraker et al., *Advanced Database Systems*. Boston, MA, USA: Morgan Kaufmann, 2016.

2. M. Winand, *SQL Performance Explained*, 2nd ed. Germany: Markus Winand, 2012.
3. R. Ramakrishnan and J. Gehrke, *Database Management Systems*, 3rd ed. New York, NY, USA: McGraw-Hill, 2002.

**Prerequisite:**

1. Understanding of fundamental database concepts, including tables, schemas, primary and foreign keys, and proficiency in SQL.
2. Familiarity with at least one Relational Database Management System (e.g., MySQL, PostgreSQL, or Oracle) to understand relational database design and query optimization.

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|---|---|---|
| **Name of the Programme**: M.Tech.. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Nature Inspired Algorithms | **Course Code**: CSPL312 | **Credit**: 03 |
| **Max Marks:100** | **CIE:40** | **SEE: 60** |
| **End Term Exam Time:** 3Hrs | **Teaching Scheme:**3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| **1** | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| **2** | **Introduction to Nature Inspired Algorithms:** Definition and Overview, Historical Context and Evolution, Significance in Modern Computing, Biological and Natural Inspirations, Applications in Optimization and Search Problems, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Artificial Immune Systems (AIS), Neural Networks and Deep Learning, Evolutionary Strategies (ES), Differential Evolution (DE), Swarm Intelligence, Memetic Algorithms, Hybrid Algorithms, Applications of Native Inspired Algorithms, Comparison with Traditional Optimization Algorithms | 7 |
| **3** | **Ant Colony Optimization:** Background and Inspiration, Biological Basis: Behavior of Real Ants, Historical Development and Key Contributors, Pheromone Trails and Their Role, Positive Feedback and Stigmergy, Exploration vs. Exploitation. Types Of Ant Colony Optimization Algorithms and its Applications, Challenges and Limitations | 10 |
| **4** | **Particle Swarm Optimization:** Background and Inspiration, Biological Basis: Behavior of Bird Flocking and Fish Schooling, Historical Development and Key Contributors, Fundamentals of Particle Swarm Optimization, Algorithm Structure and Steps, Types of Particle Swarm Optimization Algorithms and Its Applications, Case Studies and Real-World Implementations, Challenges and Limitations | 9 |
| **5** | **Genetic Algorithms:** Background and Inspiration, Biological Basis: Principles of Natural Selection and Genetics, Fundamentals of Genetic Algorithms, Genetic Algorithm Workflow, Types of Genetic Algorithms, Selection Mechanisms, Crossover Techniques, Mutation Techniques, Applications of Genetic Algorithms, Case Studies and Real-World Implementations | 8 |
| **6** | **Applications of Intelligent Algorithms:** Intelligent Algorithms in Engineering: Structural Optimization, Control Systems, Predictive Maintenance, Robotics and Automation, Case Studies and Real-World Examples. Intelligent Algorithms in Finance, Intelligent Algorithms in Marketing and Sales, and Intelligent Algorithms in Agriculture. | 10 |
| | Total | **45** |

**Text Books:**

1. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning. Boston, MA, USA: Addison-Wesley, 1989.
2. S. N. Sivanandam and S. N. Deepa, Introduction to Genetic Algorithms. New York, NY, USA: Springer, 2008.

**Reference Books:**

1. E.-G. Talbi, Metaheuristics: From Design to Implementation. Hoboken, NJ, USA: Wiley, 2009.
2. X.-S. Yang, Nature-Inspired Optimization Algorithms. London, U.K.: Elsevier, 2014.

**Prerequisite:** A basic understanding of artificial intelligence, machine learning, and computational intelligence is recommended.

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| **Name of the Programme**: M.Tech.. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Research Methodology and IPR | **Course Code**: NP40.02 | **Credit**: 03 |
| **Max Marks:100** | **CIE:40** | **SEE: 60** |
| **End Term Exam Time:** 3Hrs | **Teaching Scheme:**3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| 2 | **Research Methodology**: Basic Statistics, Inferential statistics, Central tendency of data, Standard deviation, frequency distribution, level of measurement, Probability distribution, Normal distribution, Correlation, Numerical problems, Introduction to research, Need of research, meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem | 9 |
| 3 | **Research Approaches:** Approaches of investigation of solutions for research problems, Sample design, data collection, Regression and Z-test, t-test, ANOVA, analysis, interpretation, Necessary instrumentations, Effective literature studies approaches, analysis. Plagiarism, Research ethics, examples | 9 |
| 4 | **Effective Technical Writing**: Development of Research Proposal, citation of references, Report writing, Precautions for writing research reports | 8 |
| 5 | **Nature of Intellectual Property**: Patents, Designs, Trademarks, and Copyright, Geographical Indications. Process of Patenting and Development, International Scenario, International Cooperation on Intellectual Property | 9 |
| 6 | **Patent Rights:** Scope of Patent Rights, Licensing and transfer of technology, patent Infringement and Enforcement. New developments in IPR: IPR of Biological Systems, Computer Software, etc. Case Studies on Intellectual Properties | 9 |
| | Total | **45** |

**Text Books:**


1. C. R. Kothari, *Research Methodology*, 2nd rev. ed. New Delhi, India: New Age Publications, 2004.
2. D. Chawla, *Research Methodology: Concept and Cases*, 2nd ed. New Delhi, India: Vikas Publications, 2020.
3. R. Tewari and M. Bhardwaj, *Intellectual Property: A Primer for Academia*. Chandigarh, India: Honorary Director Publication Bureau, Panjab University, 2020.


**Reference Books:**


1. G. N. Rao, *Research Methodology and Quantitative Methods*. Hyderabad, India: B S Publications, 2020.
2. P. Ganguli, *Intellectual Property Rights*. New Delhi, India: McGraw Hill Education, 2020.


**Prerequisite:** Knowledge of Basic Statistics.

# Teaching and Examination Scheme
# II Year IV Semester: M. Tech. (CSE)

| Sr. No. | Course Code | Course Name | Category | Teaching Scheme | | | Exam Hrs. | Marks | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total | |
| 1 | CSPD470 | Dissertation | REW | 0 | 0 | 32 | 4 | 360 | 240 | 600 | 20 |
| **Total Credit** | | | | | | | | | | | **20** |

# Open Electives

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| **Name of the Programme**: M.Tech.. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Data Preparation and Analysis | **Course Code**: 3CS6-60.1 | **Credit**: 03 |
| **Max Marks:100** | **CIE:40** | **SEE: 60** |
| **End Term Exam Time:** 3Hrs | **Teaching Scheme:**3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| **1** | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| **2** | **Data Gathering and Preparation:** Data Sources, Data Acquisition Techniques, Data formats, parsing and transformation Techniques, Scalability and real-time issues | 8 |
| **3** | **Data Cleaning:** Importance of Data Cleaning, Handling Inconsistent, Noisy, and Redundant Data, Heterogeneous and Missing Data, Normalization and Standardization, Feature Engineering, Data Transformation and segmentation | 10 |
| **4** | **Exploratory Data Analysis:** Overview of Descriptive and Comparative Statistics, Measures of Central Tendency and Dispersion, Data Distributions and Outlier Detection, Clustering and association, Hypothesis generation | 9 |
| **5** | **Data Visualization:** Principles of Effective Data Visualization, Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity | 9 |
| **6** | **Data Modeling and Predictive Analytics:** Introduction to Data Modeling and Its Importance, Regression Techniques: Linear, Logistic, Polynomial Regression Classification Algorithms: Decision Trees, Random Forest, Support Vector Machines (SVM), Model Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC Curve, | 8 |
| | Total | **45** |

**Text Books:**

1. P.-N. Tan and M. Steinbach, *Introduction to Data Mining*, Pearson, 2005.
2. J. Han, *Data Mining: Concepts and Techniques*, 3rd ed., Morgan Kaufmann, 2011.

**Reference Books:**

1. D. Pyle, *Data Preparation for Data Mining (The Morgan Kaufmann Series in Data Management Systems)*, Morgan Kaufmann, 1999.
2. T. Rattenbury, J. M. Hellerstein, J. Heer, S. Kandel, and C. Carreras, *Principles of Data Wrangling: Practical Techniques for Data Preparation*, O'Reilly Media, 2015.
3. G. J. Myatt, *Making Sense of Data: A Practical Guide to Exploratory Data Analysis and Data Mining*, Wiley, 2007.

**Prerequisite:** A basic understanding of programming, knowledge of mathematics, and database management.

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| **Name of the Programme**: M.Tech.. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Information Retrieval | **Course Code**: 3CS6-60.2 | **Credit**: 03 |
| **Max Marks:100** | **CIE:40** | **SEE: 60** |
| **End Term Exam Time:** 3Hrs | **Teaching Scheme:**3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| **1** | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| **2** | **Introduction Information Retrieval:** Basic Concepts of IR, Data Retrieval and Information Retrieval, Modeling of Information retrieval. Boolean Model, Vector Model, Probabilistic Model, Set Theoretical Models, Structured Text Retrieval Models. | 8 |
| **3** | **Classification of information retrieval:** Classification, Measures of Association, Cluster Hypothesis, Single Link Clusters, File Structures, Inverted Files, Index Sequential Files, Ring Structures, Doubly Chained Trees, Hash Addressing. | 9 |
| **4** | **Multimedia and Distributed Information Retrieval:** Introduction, Data Modeling, Query languages, Generic multimedia indexing approach, One Dimensional time series, two-dimensional color images, Automatic feature extraction. Introduction, Collection Partitioning, Source Selection, Query Processing, web issues | 10 |
| **5** | **Web search basics:** Web characteristics, crawling and indexes, Features of a crawler – Crawler architecture, Resolution Web data mining, finding needle in the Haystack, Searching using Hyperlinks, Page ranking algorithms: PageRank, Rank SVM. | 10 |
| **6** | **Semantic and IR applications:** Structured Web Documents, Rule Interchange Format (RIF), Question answering, Information extraction, Social Network | 7 |
| | Total | **45** |

**Text Books:**


1. R. Baeza-Yates and B. Ribeiro-Neto, *Modern Information Retrieval*, Addison Wesley Longman, 1999.
2. C. Manning, P. Raghavan, and H. Schütze, *Introduction to Information Retrieval*, Cambridge University Press, 2008.
3. R. Baeza-Yates and B. Ribeiro-Neto, *Modern Information Retrieval: The Concepts and Technology behind Search*, 2nd ed., ACM Press, 2011.


**Reference Books:**


1. C. Manning, P. Raghavan, and H. Schütze, *Introduction to Information Retrieval*, Cambridge University Press.
2. O. Frieder, *Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series*, 2nd ed., Springer.
3. B. Croft, D. Metzler, and T. Strohman, *Search Engines: Information Retrieval in Practice*, 1st ed., Addison Wesley.


**Prerequisite:** Prerequisites for a course on Information Retrieval typically include a foundation in basic computer science concepts such as data structures and algorithms, familiarity with database systems.

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| **Name of the Programme**: M.Tech.. in Computer Science and Engineering | **Year**: II | **Semester**: III |
| **Course Name:** Digital Marketing and Trend Analysis | **Course Code:** 3CS6-60.3 | **Credit**: 03 |
| **Max Marks:100** | **CIE:40** | **SEE: 60** |
| **End Term Exam Time:** 3Hrs | **Teaching Scheme:**3L+0T+0P | |

| Module No. | Contents | Hours |
|---|---|---|
| **1** | **Introduction:** Objective, Scope, Outcome of the Course and Prerequisite | 1 |
| **2** | **Introduction to Digital Marketing:** Digital Marketing, types of Digital Marketing, Scope of Digital Marketing, Factors influencing consumer behaviour, Traffic source analysis, multi-channel analysis, Latest Trends in Digital Marketing, Digital Marketing for Working Professionals, Competitor and Website Analysis, Career Opportunities in Digital Marketing. | 9 |
| **3** | **Learning WordPress:** WordPress, Role of WordPress in Digital Marketing, difference WordPress.com vs WordPress.org, WordPress installation & Setup Creating WordPress website & blog, WordPress Themes and WordPress Plugins e-commerce web sites using WordPress for Different Websites. | 10 |
| **4** | **Search engine optimization:** SEO and importance of SEO, Working for Search Engines, Traffic Analytics, Customer segmentation, Introduction to SERPs, Different SEO Ranking Factors, White Hat vs Black Hat SEO, Understanding Google algorithm On-Page SEO and Off-Page SEO, Keyword Planner, Google rankings, Link Building, Steps to optimize the website. | 9 |
| **5** | **Google Analytics and Content Marketing:** Google Analytics and its working, How to Set Up Google Analytics for Website, Google Analytics for SEO, and Recommendation system for e-commerce site. Content Marketing, Types of Content Marketing and its Goals, Different Forms of Content, Content Marketing Strategies for social media, Market basket analysis, Predicting product adoption. | 8 |
| **6** | **Email Marketing and Affiliate Marketing:** Product-based bulk emails, reasonable open rate and conversion rate. Generating traffic via a third party, Affiliate Marketing, types of Affiliate Marketing, Fake news propagation models, Fake news identification, Social Media Monitoring, Digital data treasure, Digital rights. | 8 |
| | Total | **45** |

**Text Books:**


1. S. Kingsnorth, Digital Marketing Strategy, 2nd ed. Kogan Page, 2019.
2. S. Kundu, *Digital Marketing Trends and Prospects*. BPB Publications
3. A. Sharma and D. Bansal, *Search Engine Optimization & Marketing*. Khanna Publishing House, 2020.
4. J. Heinze, *WordPress for Business Bloggers*. Wiley, 2009.


**Reference Books:**


1. P. Kotler, H. Kartajaya, and I. Setiawan, *Marketing 4.0: Moving from Traditional to Digital*. Wiley, 2017.

2. M. Chaffey and F. Ellis-Chadwick, *Digital Marketing: Strategy, Implementation, and Practice*, 7th ed. Pearson, 2022.
3. B. Halligan and D. Shah, *Inbound Marketing: Get Found Using Google, Social Media, and Blogs*. Wiley, 2014.
4. R. Fishkin and T. Hogenhaven, *Inbound Marketing and SEO: Insights from the Moz Blog*. Wiley, 2013.
5. D. Cutroni, *Google Analytics*. O'Reilly Media, 2010.

**Prerequisite:** Foundational knowledge in marketing concepts, data analytics, and familiarity with digital tools and platforms.