MS-LIS Syllabus*

Semester 1

Paper-1 Foundations of Library and Information Science

- History of libraries.
- Information, Data, and Knowledge; Evolution of Information Science as a discipline and its relation with cognitive sciences, library science, computer sciences and other disciplines; Information and Knowledge Society.
- Information Institutions of different kinds; their objectives; the library as a social institution; different type of Libraries and their functions.

- Normative principles of library and information science; The Five Laws of Library Science and their implications.
- Information and communication; Models, channels and barriers; Diffusion of Innovations; Trends in scientific communication.
- Legislative framework for library development and information provision; Public Library legislation; Delivery of Books Act; Right to Information. IPR.
- National Information Policy; Components; National Information / Library infrastructure.
- The information profession; Professional bodies (national and international) and their role.
- Open Access to Information.

Paper-2 Information Organization (Theory and Practice)

- Universe of Subjects: structure and attributes, modes of formation of subjects.
- Library Classification; Mapping of Universe of subjects in major schemes of Library classification; Species of Classification.
- General Theory of Classification; Normative Principles; The Three planes of work.
    - Basic Concepts.
    - Principles and postulates of Helpful Sequence; Facet Analysis and facet sequence
    - Notation; Kinds and Hospitality.
- Trends in classification, Thesaurofacet, Classaurus, Automatic classification, Classification in online systems, Web Dewey.
- Classification Practice: Use of latest editions of CC, DDC and UDC for classification of documents.

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* This is only a broad guideline; with the approval from the Academic Council, the concerned teacher may finalize the syllabus for a paper.

Paper-3 Cataloguing and Metadata (Theory and Practice)

- Historical study of the evolution of cataloguing and catalogue codes.
- Bibliographic files of different kinds, their nature and functions; Bibliographic Entities and Bibliographic Records; Concept of "surrogate"; Evolution of the Physical and Inner forms of bibliographic files.
- Standards for Bibliographic Organization, ISBDs, FRBR.
- Catalogue Codes – AACR 2 and CCC.
- Standards for Machine Readable Bibliographic Records – ISO 2709 and the MARC family of Formats, MARC XML; Retro conversion.
- Design of indexing languages / vocabulary control devices.
- Subject Cataloguing: Tools and Techniques – Lists of Subject Headings, Thesauri; General theory of subject indexing languages (SIL); Different systems of indexing – POPSI, Chain indexing; PRECIS etc.
- Computerization of classification / indexing; and computerized indexing systems.
- The notion of metadata. Metadata and metadata standards: Dublin Core, EAD, METS, VRA Core etc.
- Preparation of Bibliographic Records for different kinds of documents using appropriate standards and software; Filing of entries.

Paper-4. Library Management and Library Automation

- Library as a System; Components and subsystems of a Library and their inter-relationships; Library Housekeeping operations -- Acquisition and Collection Development: policy, procedures, Document circulation-functions, procedures, and methods, Serials control-functions, procedures and methods, Stock verification; Organizational structure, Library Authority and Library Committee.
- Systems analysis, workflow and organizational routines, monitoring, techniques, evaluation techniques, Library automation software.
- Schools of Management thought – classical management theory. Neo-classical theory, modern management theory, problems and conflicts in management theories. Principles of management.
- Management functions – planning, organizing, staffing, leading, Budgeting and controlling. Human Resource Management – personnel management, and manpower planning.
- Human Resource Management: Delegation, communication and participation, Job description and analysis; Job evaluation, Inter-personal relations, Recruitment procedures, Motivation; Group dynamics, Training and development, Discipline and grievances, Performance appraisal.
- Financial Management: budgeting and different types of budgets- PPBS, ZBB, Line Budget; Costing, cost and benefit analysis, Resource mobilization. Outsourcing.
- Project Management: PERT, CPM, Management of change; TQM -- Definition, concept, elements, Quality audit, LIS related standards, Technology management, ISO 900 series.
- Performance parameters; Measurement, Reengineering. Time and Motion Study, SWOT.

- Reporting: Types of reports: Annual Report-compilation, contents and style, Library statistics.
- OR Techniques, modelling and simulation.
- Preservation of Library materials.

Note: *Library automation concepts are introduced / taught (both theory and practice) wherever it is necessary, particularly, when house-keeping operations are taught.*

Paper-5. Foundations of Computers and Information Technology

- Information Technology: components, impact on society.
- Evolution of Digital Computers.
- Number systems: Binary, Octal, Hexadecimal, Representation of Numbers in Computers – unsigned and signed integers (sign-magnitude, 1's complement, 2's complement), floating-point numbers.
- Character Representation: ASCII and UNICODE.
- Introduction to Boolean Algebra, logic gates : AND, OR, NOT, NAND, NOR, EX-OR, Truth tables, Function representation in sum-of-product and product-of-sum forms.
- Basic Components of a Computer - Arithmetic Logic Unit - Half-adder, Full-adder, Multiplier; Control Unit; Memory Unit - Static and dynamic RAM, ROM, Cache memory; Input/Output devices – keyboards, monitors, printers, scanners, secondary storage elements.
- Operating Systems: Linux, Windows, Shell programming, Hypertext, Hypermedia, Multimedia and File Formats.
- User Interfaces and data visualization.
- Information Technology – Issues for Information Professionals.
- Handling any standard DBMS package (through lab work or assignments).

Paper-6: Elements of Mathematics - I

Sets: Sets and their representation; Universal Set; Empty Set; Subsets; Power Set' Venn Diagrams; Union and Intersection of Sets; Difference of Sets; Complements of Sets.

Trigonometry: Measuring angles in radians and degrees and conversion between the two measures. Positive and negative angles. Definitions of trigonometric functions sin, cos, tan, sec, cosec and cot. Signs of trigonometric functions and sketch of their graphs. Expressing $\sin(x + y)$, $\cos(x + y)$ in terms of $\sin x$, $\sin y$, $\cos x$ and $\cos y$. Identities related to $\sin x + \sin y$, $\cos x + \cos y$, $\sin x - \sin y$, $\cos x - \cos y$, $\tan(x \pm y)$, $\cot(x \pm y)$. Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$, $\tan 3x$. Simple applications of the sine and cosine formulae.

Algebra: (a) Definition of rational and irrational numbers; (b) Logarithms: Definition, simple applications, expansions of $\log(1+x)$, $\log(1-x)$ and e^x; (c) Surds: definitions and applications; (d) Quadratic equations solutions; (e) Complex numbers: need for complex numbers, motivation based on the inability to get real solutions for every quadratic equation; Defition of i ($\sqrt{-1}$), polar representation, simple applications; (f) Binomial theorem: statement and proof, general and middle term in the binomial expansion, simple applications; (g) Permutations and Combinations:

Fundamental principle of counting, factorial *n*, permutations and combinations, simple applications; (h) Sequence and Series: Basic descriptions, arithmetic and geometric progressions (AP and GP), general terms, sum of *n* terms, arithmean mean (AM) and Geometric Mean (GM), relation between AM and GM, sum to *n* terms of special series such as $\_i$, $\_i^2$ and $\_i^3$; (i) Basic idea of mathematical induction;

Coordinate Geometry: (a) Straight line: slope of a line, angle between two lines, various forms of equation of a straight line, distance of a point from a line; (b) Conic Sections: circles, ellipse, parabola, hyperbola, standard equations and simple properties.

Semester 2

Paper-7: Information Sources, Systems and Services

- Information sources - Documentary and Non-Documentary; Primary, Secondary and Tertiary Sources of Information and their Characteristics; Detailed Study of major types of secondary sources.
- Different categories of information systems such as libraries, documentation centres, information clearing houses, referral centres, information analysis centres, databanks etc; their structure, functions, products, and services; Different kinds of information systems – Decision support systems, MIS, GIS, etc.
- Major Operational Information Systems and Programmes at the Global Level; Discipline / Mission-oriented systems as well as Information Systems specializing in different kinds of documents (Patents, Theses & Dissertations, Research Reports, etc)
- The Information User: Information needs, use and user studies.
- Information Products and Services: Document Delivery, Translation; Current Awareness, etc services; Trend Reports, Information Analysis and Consolidation Products and services.
- Multimedia resources; Portals, Wikipedia, Content Management; Subject Gateways.
- Multilingual Resources.

Paper-8: Elements of Statistics and Research Methodology

- Methods of data collection; Scales of measurement; Presentation of data – graphical and tabular; Frequency tables, histogram, frequency curves; Measures of central tendency and dispersion; Correlation and regression analysis; Curve fitting.
- *Probability:* Concepts: Classical and axiomatic, properties of a probability measure; conditional probability, etc.
- Independent events, random variable, discrete and continuous random variable, distribution function, probability density functions.

- Discrete probability distributions: Binomial, Poisson, and geometric and negative binomial distributions. Continuous probability distributions; exponential, normal and lognormal distributions.
- Testing of hypotheses: z-test & t-test, and Goodness-of-fit test, Confidence intervals.
- Research – concept, meaning, need and process of research; types of research: fundamental and applied including inter-disciplinary and multi-disciplinary approach.
- Research Design – conceptualization and operationalization; Identification and formulation of problems; Hypothesis; Nominal and operational definition, ethic aspects; Writing research proposals.
- Literature search. Reviewing of articles.
- Research Methods – scientific, historical, descriptive, survey methods, case studies, Delphi & experimental methods.
- Research Techniques and Tools sampling and methods sampling; Tools for data gathering -- Questionnaire, interview, observation, library records and reports etc.
- Research Reporting – structure, style, concepts, guidelines for research reporting, style manuals – Chicago, MLA, APA etc.
- Current Trends in Library & Information Science Research.
- Use of statistical package: SPSS or SAS or any other well-tested and proven packages.

Paper-9: Digital Libraries

- Historical Development of Digital Libraries. Copyright and license issues.
- Digitization: Software, Hardware and best practices; Scanners and scanner types; Optical character recognition and comparative study of OCR software.
- Open Standards and File Formats, Metadata and Metadata Standards
- Digital library software: Features and comparative study of Dspace, Eprints and Fedora; Harvesting Metadata, OAI-PMH and DL Interoperability; Harvester software.
- Digital Library Architectures; Grid architecture. Open URL integration. Digital Preservation: PREMIS. Persistent identifiers: DOI and CNRI Handles; Multilingual digital repositories and Cross-language information retrieval

Paper-10: Data Structures and Computer Programming

- Fundamentals of programming techniques, flowcharting, Introduction to C programming language. Arrays. Linked Lists: Singly linked, doubly linked and circularly linked.
- Stacks and queues. Applications – Polish postfix conversion, FCFS scheduling. Binary trees - Implementation, Traversal algorithms. Binary Search Tree, AVL tree.
- B-tree – application in database design. Recursive programming - Differences between recursion and iteration. Sorting – Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Heap sort. Searching – Linear search, Binary search. Hashing - Chaining and open addressing, collisions.
- Graphs. Pointer-based and array-based representation. Breadth-first and depth-first traversals. Shortest path algorithms.

- Fixed length / variable length records, pinned / unpinned record, indexed files. Object oriented programming. Java or a similar language.

Paper-11: Colloquium

Paper-12: Elements of Mathematics - II

Relations and Functions: Ordered pairs, Definition of a relation, domain and range of a relation. Functions as a special kind of relation from one set to another, domain and range of a function, real valued functions of the real variable, graphs of standard functions. One to one and onto functions, inverse of a function, composite functions.

Calculus: Limit of a function. Continuous functions. Definition of a derivative, its relation with the slope of a tangent of the curve. Derivatives of products and quotients of functions, derivatives of polynomial and trigonometric functions, derivatives of composite functions, chain rule, Rolle's and Mean Value Theorems (without proof). Applications in determining rates of change and maxima/minima. Integration as an inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts. Definite integrals as limits of a sum. Fundamental Theorem of Integral Calculus (without proof), basic properties, applications in finding areas under simple curves.

Semester 3

Paper-13: Information Storage, Retrieval and DBMS

- Different types of storage media, physical level of a DBMS – use of B-trees, Trees. Overview of IR Systems, Historical Perspectives. Document Representation: Statistical Characteristics of Text, Basic Query Processing. Classic IR: basic concepts, Boolean model, vector model, probabilistic model.
- Alternative IR: set theoretic, algebraic models, and probabilistic models (Bayesian networks). Structured Text Retrieval Models: model based on non-overlapping lists and proximal nodes. Text Operations: document pre-processing (word stemming, stop words, thesauri), document clustering.
- IR Systems and the WWW, Heterogeneous Information Sources, Intelligent Web Agents.
- Evaluation of IR. Search methodology, algorithms. Cognitive IR modelling.
- Searching vs. browsing; dynamic query formulation and reformulation. Query: keyword based querying, pattern matching, structural queries, query protocols.
- Hybrid statistical and knowledge approaches: query expansion and refinement based on a similarity thesaurus and ontologies.

- Introduction to DBMS - File management vs. Database management, integrity and security issues. E-R Models, Enhanced E-R Models. Logical Database Design, Relational Database Model, Normalization. SQL, Implementation in MySql or PostgreSql. Concurrency in databases.
- Object-Oriented Models. Multimedia Databases. Database Security - models, security implementation, relationship to web databases

Paper-14: Content Management Systems

- Introduction; benefits. Relationship with other information systems: document management, records management, digital asset management. Principles of CMS. CMS Architecture. System and data integration in CMS. Applications. CMS and Community Information Systems.
- Roles of other related technologies: XML, DBMS, Portals, Data Mining, Agent technologies, Personalization, Study of CMS Softwares, Evaluation of CMS.

Paper-15: Informetrics and Scientometrics

- Informetrics: Genesis, scope and definitions.
- Classical bibliometric laws: Zipf's law, Lotka's law, Law of scattering (Bradford's law); Generalised bibliometrics distributions. Fitting of Informetrics models: Bradford's curve, Leimkuhler's distribution, etc. Aspects of concentration measures; 80-20 rules, Price's law relating to scientific productivity. Circulation. Statistics.
- Growth and obsolescence of literature: Various growth models; the half-life analogy; determinations of aging factor and half-life: real vs apparent; synchronous vs diachronous.
- Citation analysis: Citation indexing, including bibliographic coupling and co-citation analysis.
- Science indicators & mapping of science.

Paper-16: Web Technology and Web-based Information Services

- HTML, XML, DHTML, XHTML. TCP/IP, FTP, SSHD. Web servers: Apache etc.
- CGI Programming, Java scripts. Java scripts and JSP. Database connectivity: odbc, jdbc
- Protocols: SOAP etc. RSS feeds, Blogs, Open URL. Relevant W3 Standards and Protocols.
- Search Engines, cluster based search engines and building search engines. Search Algorithms. Security Issues.

Paper-17: Dissertation

Semester 4

Paper-18: Networking Technology and Library Networks

- Networking- concepts. Type of Networks: LAN, MAN and WAN. Networking Topologies: Star, Bus, Token Ring, Hybrid. Networking Hardware. Network layer protocols: The Internet Protocols (IP), IPv4 and IPv6.
- Transport layer protocols: TCP, UDP and AAL. Application protocols: HTTP, FTP, Telnet. Network level services: Name lookup and DNS. Communication protocols: Z39.50, OAI-PMH, SRU/SRW, SOAP.
- Integrated Services Digital Network (ISDN), Open Systems Interconnection (OSI). DNS, Mail Servers, Listserves.
- Internet and World Wide Web: Components, Services, Browsing, Search Engines.
- Library Networks: OCLC, BLAISE, INFLIBNET, STN, RLIN.

Paper-19: Knowledge Management

- Knowledge economy – features / characteristics, national information infrastructure, complex nature of knowledge, taxonomy of knowledge & knowledge management strategies.
- Intellectual capital – components, measurement, KM measurement.
- Technology for KM -- KM enabling tools, knowledge portals and characteristics, knowledge sharing and various sharing models, knowledge culture etc.
- Communications and organization culture. Communication – different types, models etc.
- Case Studies.

Paper-20: Semantic Web

- Knowledge organization and information access Systems. Objectives, key issues and problems in information retrieval and KO. Information organization in bibliographic systems.
- Knowledge structures – systems for knowledge organization, knowledge representation, social epistemology, relationships between classification, taxonomies, ontology (classification schemes and taxonomies, cataloguing and metadata, thesauri and ontology).
- Human cognition and mental structures.
- Ontology languages -- OWL, DAML.
- Beyond traditional authority files: Knowledge organization for digital libraries – natural languages processing: syntactic analysis, Universals and parsing algorithms; Data and text mining; Semantic Web, RDF. Enterprise Information Architecture.

Paper-21: Elective

Note: *Syllabus for One of the electives is given below. Syllabus for other electives will be provided as and when they are offered.*

Data & Text Mining

- Data warehousing: Introduction, Definitions, Multi-dimensional data model. OLAP and OLAP Engine.
- Data Mining: Introduction, Definitions, KDD vs DM, DBMS vs DM, DM techniques, Issues and Challenges, Applications. Association rules: Introduction, Methods to discover association rules, Algorithms.
- Clustering techniques: Clustering paradigms, Partitioning algorithms, k-Medoid algorithms, Hierarchical clustering.
- Decision trees: Tree construction principle, Decision tree construction algorithm, Presorting.
- Web mining: Content, structure and usage mining, Text mining, Image and multimedia mining.

Paper-22: Dissertation