Appendix A

International School of Information Management

M. Tech (Information Systems & Management)

A. Syllabus Outline

Total credits: **64**

Core subjects	
Semester 1:	
MISM 501	Statistics & Data Analysis (4 credits)
MISM 541	Information Economics (3 credits)
MISM 513	Theories of Information (3 credits)
MISM 515	Information Organization (3 credits)
MISM 521	Foundation of Software systems (4 credits)
MISM 502	Theoretical Foundation of Computing(4 credits)
Semester 2:	
MISM 516	Taxonomies, Ontologies and Semantic Web (3 credits)
MISM 532	Content Management and Electronic publishing (3 credits)
MISM 522	Information Systems design and development (3 credits)
MISM 524	Internet technologies (3 credits)
Semester 3 & 4:	
MISM 621	Data mining and data warehousing (3 credits)
MISM 623	Information Retrieval Systems (3 credits)
MISM 625	Human Computer Interactions (3 credits)
MISM 643	Program Management & Management Strategies (3 credits)
MISM 642	IPR and Cyber laws(2 credits)
Total credits earned by taking the core courses – **47 credits**	

Candidates has to choose elective in such a combination as to earn a min.**12 credits**	
	Electives: 651 Bio Informatics (4 credits) 652 Geo Informatics (4 credits) 654 Information assurance and security (3 credits) 655 Natural Language processing (3 credits) 656 Multimedia content management (3 credits) 657 Information Industry and Entrepreneurship(2 credits) 653 Health Informatics (4 credits) 659 Entreprise Content Management (3 credits) 661 Pattern recognition and image processing (4 credits) 662 Computer Graphics (3 credits) 663 Text Mining(3 credits) 664 Cultural Informatics (3 credits) 668 Multilingual Information Management (2 credits) 665 e Governance (2 credits) 666 e-Learning (2 credits) 658 Knowledge Management(2 credits)
MISM 671	Project Work – **5 credits**

B. Scheme of Examination

- The students performance is examined based on continuous assessment by the faculty
- The assessment will be based on classroom interaction, tests, quizzes, mid-term review, seminars, projects and other assignments.
- There is no external examiner. All assessments are by the concerned faculty.
- There shall be a Term End Examination. The weightage is 50:50 (Continuous assessment and End of the Term Examination)
- The Project Work will be assessed by a faculty committee.
- Grading Pattern

P	**G**	**GP = V x G**
$96 \leq P \leq 100$	10	V x 10
$90 \leq P \leq 95$	9	V x 9
$80 \leq P \leq 89$	8	V x 8
$70 \leq P \leq 79$	7	V x 7
$60 \leq P \leq 69$	6	V x 6
$55 \leq P \leq 59$	5	V x 5
$50 \leq P \leq 54$	4	V x 4
$41 \leq P \leq 49$	3	V x 3
$31 \leq P \leq 39$	2	V x 2
$00 \leq P \leq 30$	0	V x 0

M. Tech in Information Systems and Management

Syllabus Outline

Semester 1

MISM 501: Statistics & Data Analysis

Course Objectives

The course is an introduction to statistical inference and a survey of the most commonly used inferential procedures, mathematics and statistics especially designed to provide a good grounding in these areas.

Course Outline

Unit 1. Basic Statistics and Mathematics.

Probability theory; Sample space and events; Conditional probability, Independent events, Bayes formula,

Random Variables; distributions. Uniform, Poisson, Normal, Bernoulli and Binomial Distributions; Extreme value statistics and the Gumbel Distribution

Matrix algebra, Review of linear algebra, Operations, determinant, inverse. Solving linear equation. Eigenvalues and eigenvectors.

Unit 2. Descriptive Statistics

Numerical description of Data; Measures of Central tendency (the Mean, Median and Mode); Measuring the variation in Data Standard Deviation, Population Variance, Sample Variance, Significance of Standard Deviation. Histograms, Distributions and density.

Unit 3. Inferential Statistics

Normal distribution. Exploratory Data Analysis, Bivariate, Correlation. Statistical inference. Hypothesis testing. Classical (t test, F test, Pearson), Nonparametric (Wilcoxon, Spearman) and Robust.

Goodness of Fit, classical (chi square) and nonparametric (Kolmogorov-Smirno) methods. Review of counts and proportions, contingency tables. Analysis of Variance (ANOVA), classical and nonparametric (Kruskal-Wallis and Friedman) methods.

Unit 4. Simple Regression Analysis. Bivariate regression. Linear and nonlinear, Multivariate regression Least squares multiple regression. Stepwise Polynomial regression, Multivariate analysis eigenvector methods. Principal Components (PCA), factor analysis, correspondence analysis. discriminant analysis, canonical correlation, cluster analysis

Course Readings

1. Sheldon Ross. A first Course in Probability, Sixth Edition , Pearson Education Asia, 2002.
2. Kirk, Roger E. *Statistical Issues: A Reader for the Behavioral Sciences*. Brooks/Cole, 1972. [HA29 K55]—by Skipper (pp. 141–145).

MISM 541 Information Economics

Course Objectives

This is a course on various microeconomic theories of information and a study of the economics of information focusing primarily on how asymmetric information, principal- agent problems or adverse selection affect economic outcomes. The course will also cover the study information transportation in Networks, information content and markets for information. The course covers the use of information and computation systems to implement markets and some issues in information and complexity. The purpose of the course is to introduce students to the effect of asymmetric information on the efficiency properties of market outcomes and the kind of institutions & patterns of behavior develop in response to informational asymmetries.

Course Outline

Unit 1. Introduction to information in the economy; Macroeconomics of information. input-output analysis. The measurement and analysis of the role information plays in the economy. Risk & Uncertainty. The value of information asymmetries and Market failures.

Unit 2. Marginal cost, marginal product, marginal utility, indifference curves, marginal rate of substitution, competitive equilibrium. Information sector: information as input and output Economic analysis of the resources devoted to production, distribution and consumption of information. The economics of information technology and content Industry- mass media, the internet, scholaely publishing.

Unit 3. Agency theory. The principal agent problem: the moral hazard problem, hidden information problems, monopolistic screening. Signaling and screening. Adverse selection concept, lemons problem, game theoretic approach. The imperfect competition.

Unit 4. Auctions & contests. Mechanism design and its applications. Applications in bargaining nd auctions. Applications of information economic principles to finance.

Books/ References:

1. Information Economics by Urs Birchler & Monika Butler, Routledge, 2007.
2. Information Rules: A strategic Guide to the Network Economy by Carl Shapiro & Hal R Varian, 1998

MISM 513 Theories of Information

Course Objectives

1. To familiarize the students to the concepts and theories of information from different fields such as electrical engineering to economics to cognitive science as relevant to information Management
2. To provide a theoretical construct and a framework for the study of information Management including information behavior & behavioral economics.
3. To enable students to apply the concepts and frameworks from the research literature to specific examples and cases.

Course Outline

Unit 1. Concepts and notions of information. Study of information from different and diverse perspectives. Understanding theories and paradigms of information from the transmission engineering perspective to cognitive to economics perspective.

Unit 2. Information theory. This unit will provide a foundation to the information theory. The fundamental concepts of information theory and its application in present day communication systems would be introduced. The axiomatic approach to the development of Shannon`s measure of information will be given. The practical significance of noiseless coding theorem will be examined. The concept of channel capacity will be introduced and the calculation of the capacity of important communication channels and systems will be dealt with. The capacity theorem, the concept of source coding, subject to fidelity criteria,(rate distortion theory) will be introduced. Information theory explores the fundamental limits of the representation and transmission of information. The definition and implications of (information) entropy, the source coding theorem, and the channel coding theorem will be covered. The direct applications of information theory will also be explored.

Unit 3. Game theory. Game theory has found its applications in numerous fields such as Economics, Social science, political Science, Evolutionary Biology and now in computer science. The nature of computing is changing because of the success of internet and the revolution in information technology. This unit provides an basic understanding of various game theoric concepts and its application in different domains. The evolutionary and epistemic foundation of solution concepts, such as rationalzability and Nash equilibrium would be investigated. It covers classical topics such as repeated games, bargaining and supermodular games as well as new topics such as global games, heterogeneous priors, psychological games and games without expected utility maximization.

Unit 4.Cognitive approach to information, information seeking and use. Cognitive Architecture.

Reference :

1. Elements of Information Theory, by Thomas Cover & Joy Thomas, Wiley, 1994.

2. Information Theory, Inference and learning Alograthims, David J.C Mackay.
3. Silicon Dreams, Robert W. Lucky, St. Martins Press, 1989.

MISM 502 Theoretical Foundation of Computing

Course Objective and description: This course aims to provide the students strong foundations in various theoretical aspects of computing. It covers the following broad categories of topics:

1. Introductory Mathematical Concepts
2. Mathematical Models of Computation
3. Computability of Problems
4. Complexity of Algorithms

Unit 1. Basic Mathematical Concepts: 1. Mathematical Logic ; 2. Set Theory ; 3. Graph ; 4. Proof Techniques

Unit 2. Mathematical Models of Computation : 1. Regular Languages ; 2. Context-Free Languages

Unit 3. Computability of Problems: 1. Turing Machines ; 2. Limits of Algorithmic Computing;

Unit 4. Complexity of Algorithms: 1. Asymptotic Analysis of Algorithms ; 2. Time Complexity and Classes of Problems ; 3. Brief Introduction to Space Complexity ; 4. Brief Introduction to Intractability of Problems References

1. Michael Sipser (1996). Introduction to the Theory of Computation. International Thomson Publishing.ISBN 053494728X.
2. Harry R. Lewis and Christos H. Papadimitriou (1997). Elements of the Theory of Computation.
   Prentice Hall PTR, Upper Saddle River, NJ, USA. ISBN 0132624788.
3. Peter Linz (2001). An Introduction to Formal Languages and Automata. Jones and Bartlett Publishersjnc, USA. ISBN 0763714224.
4. Thomas H. Gormen, Cli_ord Stein, Ronald L. Rivest and Charles E. Leiserson (2001). Introduction to Algorithms. McGraw-Hill Higher Education. ISBN 0070131511.
5. Ronald L, Graham, Donald E. Knuth and Oren Patashnik (1994). Concrete Mathematics. Addison- Wesley, Reading, MA, USA. ISBN 0201558025.
6. Adrian Bondy and.U. S. R. Murty (2008). Graph Theory. Springer London, Limited. ISBN 1846289696.
7. John K. Truss (1991). Discrete Mathematics for Computer Scientists. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA. ISBN 0201175649.

MISM 515 Information Organization

Course Objectives

1. To introduce the intellectual foundation of Information organizations and provide an in depth understanding of the organizational principles in different genres of information.
2. Enable students to learn how information organization is carried out by professionals, authors and users; by individuals in association with other individuals, and as part of the business processes in an enterprise and across enterprises.
3. To give strong grounding in the philosophical basis of information organization.
4. To familiarize students to the principles and techniques of information organization – classification, indexing, metadata, meta structures.

Course Outline

- Concepts and notions of organization. Concept of order, structures, symbols and relationships. Language and information representation and Concepts and categories.
- Philosophical basis of information organization – from Aristotle to Dewey to Ranganathan. Trees and hierarchies, categories and facets.
- Representation and organizational categorization, indexing and content analysis. Data structures and databases.
- Case studies of different genres and the principles of organization – document genres – essays, poetry, drama; indexes, databases and secondary information products; blogs and wikis; websites and portals.
- Study of different classification systems, indexing languages and their theoretical basis
- From Ontologies to folksonomies – expert classification to citizen tagging.
- Tools, formats and standards organizing information and information items – metadata and other frameworks.
- Vocabulary control. Codes, formats and standards for data representation and transfer.

Course Readings:

1. Svenonius, Elane. *The Intellectual Foundation of Information Organization*. London : MIT Press, 2000
2. 2. Stock, Oliviero; Zancanarao, Massimo (eds.): *Multimodal Intelligent Information Presentation*, Springer, 2005

MISM 521 Foundations of Software Systems

Course Objectives

1. To introduce students to the concepts, methods and current practice of software engineering.
2. To enable the students to systematically study of large-scale software systems.
3. To provide a good foundation in the development of software for different applications

Course Outline

- Fundamental concepts and techniques for analysis, design and implementation of software systems. Survey of the software engineering processes, tools, and techniques used in software development and quality assurance. Life-cycle models, process modeling, requirements analysis and specification techniques, quality assurance techniques, verification and validation, testing, project planning, and management.
- Software production; software life cycle models as an organizing structure; principles and techniques appropriate for each stage of production.
- Transition from basic programming skills to a rigorous process of software development. Familiarization with higher programming techniques (recursion, generic programming and constructs (object-orientation, lists, stacks, queues, searching, sorting). Understanding the connection between mathematical / algorithmic thought (logic, sets, functions, number bases) and implementation.
- Data structures and algorithms: abstract data types and data structures, efficiency of algorithms, binary tree representations and traversals, searching (dictionaries, priority queues, hashing), directed graphs and graph algorithms, language grammars.
- Object-Oriented Languages: language and development / execution environment difference, including data types, control structures, arrays and I/O; addressing and memory management issues including pointers, references, functions and their passing conventions; object-oriented design specifics related to structured data and classes.
- Knowledge and skills for effective software project management, including project planning and tracking and people management. Risk analysis, project scope, scheduling, resource allocation, cost estimation, negotiation, monitoring and controlling schedule, software metrics, quality management, process improvement, staffing, leadership, motivation and team building.

Semester 2

MISM 516 Taxonomies, Ontologies and Semantic Web

Course Objective

The course is designed to equip students with the latest developments in the Semantic Web scenario. The course aims at developing skills in the areas of building ontologies and ontology-based knowledge management systems. The focus is laid on development of ontologies and application of ontology languages.

Course Outline

1. Knowledge Organization Systems – Term Lists; Classification and categorization systems; Relationship Models

2. Taxonomy – Descriptive taxonomies; Navigational taxonomies; Data management vocabulary; Role of taxonomies in content management; Building and maintaining taxonomies
3. The Semantic Web Vision
4. Ontology Languages for the Semantic Web – RDFS, OWL, OIL and DAML+OIL
5. Ontology Query Languages – RDQL, SeRQL
6. Ontology Editing Tools
7. Ontology – Inference and Reasoning
8. Ontology – Application and techniques

Course Readings

1. Building Taxonomies (Chapter 6) in *Unlocking Knowledge Assets*. Susan Conway and Char Sligar, Microsoft Press
2. Antoniou, Grigoris and Frank van Harmelen. *A Semantic Web Primer*. The MIT Press, London. 2004.
3. Davis, John et al (eds.). *Towards the Semantic Web: Ontology-driven Knowledge Management*. John Wiley & Sons, New York. 2005
4. Gomez-Perez A.; Mariano Fernandez-Lopez, Oscar Corcho.: Ontological Engineering. London: Springer-Verlag. (2003).
5. W3C: Ontology Web Language (OWL) Guide. http://www.w3.org/TR/owl-guide/. (2004).
6. Beck, H. and Pinto, H.S.: Overview of Approach, Methodologies, Standards and Tools for Ontologies. UN: The Agricultural Ontology Service, FAO. (2002).
7. Fensel, Dieter et al. *Spinning the Semantic Web: Bringing the World Wide Web to its full potential*. The MIT Press, England. 2003

MISM 532 Content Management and Electronic Publishing

Course Objectives

The course is oriented across creation and management of e-content. The course discusses information architecture and mark-up languages as a means to design, relate and compose documents for the web. The course equips students to (a) plan and design web-based content based on information architecture (b) utilize mark-up languages for text and graphic presentation (c) manage content formatting with style sheets. The electronic publishing focus on (a) Understanding the fundamental concepts of XML and related technologies (b) Acquire knowledge on how XML is currently being used in various application areas. (c) Understand the syntactic and semantical aspects of XML documents (d) Know how to parse and transform XML documents via tools and through programming APIs (e) Have some exposure on XML activities in e-publishing areas.

Course Outline

- Content types. Document genres. Digital document genres. Case study of different digital content genres.

- Information Architecture – Organization, labeling, navigation, searching metadata
- Information Architecture – Process and Methodology – Research, strategy, design, documentation
- Markup Languages: HTML, SGML, XHTML; Web Design; Web Page Content vs. Appearance
- Beyond Text Content: Images, color, multimedia objects; Hypertext; Lists, Tables and Frames; Cascading Style Sheets – styles, syntax, properties, tag-less styles
- Forms – tags, layout, contents, targeting
- Executable Content – Applets and Java, Embedded content, JavaScript, JavaScript Style Sheets, Tools – Macromedia Flash
- Overview of XML Technologies
- XML Fundamentals
- XML Programming in Java
- XML in Enterprise Application
- XML in e-commerce (Web Services)
- Open Source XML Projects
- XML Tools

MISM 522 Information Systems Design and Development

Course Objectives

The course is designed to equip students with essential skills required in information systems design and development.

Course Outline

- Introduction to Information Systems – Fundamentals of information systems; Technical and organizational foundations of information systems, building information systems, managing information systems resources.
- E-Business System Development – key e-business enabling information technologies.
- Database Management – Database design, development and administration.
- Database Systems and Applications – Logical data models, relational database systems, structured query language (SQL), conceptual modeling, database design, web-connected databases,
- Systems Analysis and Design – Analysis phase of systems development. Development life cycle, feasibility studies, analysis of user requirements, development of logical system models.
- Systems Implementation – software project management, system / database design, GUI, Software testing, integrating web and business environments.
- Information Systems Development – user requirement analysis, logical and physical system models, system implementation and maintenance, project valuation and management.

MISM 524 Internet Technologies

Course Objectives

The objective is to provide state of the art knowledge and specialist skills on a broad range of Internet technologies and systems.

Course Outline

- Network technologies – The techniques of telecommunication networks and the management of information technologies and networks. Internet architectures, technologies, applications, and protocols. Baseline Internet technologies such as TCP.IP, routing, switching, address and domain name management, email, and the World Wide Web (HTTP). Design and delivery of data and voice over networks. Setting up local area Networks and Wireless Networks. Network architectures; design and analysis of efficient LAN protocols; state-of-the-art local area networks, including multi-access networks, token passing networks, and optical local area networks; Internet communications.
- Design and development object-oriented web applications. The client-server model and 3-tier architecture. The interrelationship of back-end and front-end systems.
- Object-Oriented methodology, Enterprise Software Application Architecture, Design Patterns, Enterprise Java Beans, Database Connectivity, and Web Application Server Development and technologies such as Servlets, JSP, XML, HTML, Security, JDBC, RMI and Multithreading.
- Programming for the Internet – JAVA Programming.
- ASP and PHP Fundamentals.

Semester 3

MISM 623 – Information Retrieval Systems

Course Objectives

This course examines information retrieval within the context of full-text datasets. The students should be able to understand and critique existing information retrieval systems and to design and build information retrieval systems themselves. The course will introduce students to traditional methods as well as recent advances in information retrieval (IR), handling and querying of textual data. The focus will be on newer techniques of processing and retrieving textual information, including hypertext documents available on the World Wide Web.

Course Outline

Topics covered include:

- IR Models
  - Boolean Model
  - Vector Space Model
  - Relational DBMS
  - Probabilistic Models
  - Language Models

- Web Information Retrieval
  - citation network analysis
  - social collaboration (PageRank and HITS algorithms)

- Term Indexing
  - Zipf's Law
  - term weighting

- Searching and Data Structures
  - Inverted files to support Boolean and Vector Models
  - Clustering
    - non-hierarchical
      - single pass
      - reallocation
    - hierarchical agglomerative
  - String Searching
  - Tries, binary tries, binary digital tries, suffix trees, etc.

- Retrieval Effectiveness Evaluation
  - Recall, Precision, Fallout
  - Comparing systems using average precision

Course Readings:

1. Modern Information Retrieval / by Ricardo Baeza-Yates and Berthier Ribeiro-Neto, 2001
2. Readings in Information Retrieval Edited by Karen Sparck Jones and Peter Willett
3. Mining the Web: Discovering Knowledge from Hypertext Data / Soumen Chakrabarti, Morgan-Kaufmann Publishers, 2003.
4. Managing Gigabytes: Compressing and Indexing Documents and Images by Ian H. Witten, Alistair Moffat, and Timothy C. Bell.
5. Introduction to Information Retrieval / Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, (Due for publication by Cambridge University Press in 2007)
6. TREC Volumes

MISM 642 IPR and Cyber Laws

Course Objectives

The course is designed with an objective of providing students an understanding of Intellectual Property Rights and Cyber laws.

Course Outline

- Scope of Cyber Laws – Nature of Cyber Space, Cyber Property, Cyber Personality, Cyber Transactions
- Cyber Jurisprudence – Concepts of Historical, Analytical and Ethical Jurisprudence, Relationship between Meta Society Laws and Cyber Laws, How Cyber Laws need to be developed.
- Law of Digital Contracts – Digital Contract – Definition; Formation of Digital Contracts, System of Digital Signature, Role and Function of Certifying Authorities, The Science of Cryptography
- Intellectual Property Issues in Cyber Space – Domain Names and Related Issues, Copyright in the Digital Media, Patents in the Cyber World,
- Information Technology Act, 2000
- International Scenario in Cyber Laws
- Cyber Law Issues for Management – issues in E-business management, cyber evidence management, cyber law compliancy audit
- IPR Policies. WIPO, National IPR Policy

MISM 621 – Data Mining and Data Warehousing

Course Objectives

Data Mining and Data Warehousing are powerful computational tools developed over the last decade for extracting strategic information from massive repositories of enterprise data. This course will introduce the basic concepts, techniques and applications of Data Mining and Data Warehousing.

Course Outline

Data Mining:

Overview; Types of Patterns; Algorithms for Classification, Clustering, Association Rules, Outliers, Privacy Preservation; Data Preprocessing (Feature Selection, Discretization, Sampling); Web Mining; Applications and Case Studies

Course Readings:

1. Data Mining: Concepts and Techniques. Jiawei Han and Micheline Kamber Morgan Kaufmman Publishers, 2000
2. Data Mining: Practical Machine Learning Tools and Techniques with JAVA. Ian H. Witten and Eibe Frank Morgan Kaufmman Publishers, 2000
3. Introduction to Data Mining. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Pearson Addison Wesley, 2005
4. Data Mining: Introductory and Advanced Topics. Margaret H. Dunham, Prentice Hall, 2003

Data Warehousing

Overview; Data Cubes; On-line Analytical Processing; Warehouse Architectures; Data Visualization; Data Preparation; Applications and Case Studies

Course Readings

1. Data Warehousing Fundamentals. Paulraj Ponniah, Wiley, 2001
2. The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling Ralph Kimball and Margy Ross, Wiley, 2002.

MISM 625 Human Computer Interactions

Course Objectives

The course objective is to introduce the concepts, issues, methods and challenges of improving the interaction between users and computers by making computers more user-friendly and receptive to the user's needs. The course is concerned with

- Methodologies and processes for designing interfaces
- Methods for implementing interfaces
- Techniques for evaluating and comparing interfaces
- Developing new interfaces and interaction techniques
- Developing descriptive and predictive models and theories of interaction

Course Outline

1. Principles of HCI. History and interacting disciplines: Psychology, Cognitive Science, Ergonomics, Computer Graphics and Visualization, Artificial Intelligence, Design, Notable Systems and Prototypes – Dynabook, Knowledge Navigator, Project Looking Glass, The Humane Environment

2. Hardware for improving Human Computer Interaction: Input Devices, Output Devices

3. Usability: Usability Testing, User Testing, Heuristic Evaluation, Cognitive Walkthrough, Cognitive Dimensions of Notation, Usability Lab

4. Models and Laws: Hick's Law, Fitt's Law, GOMS – Goals, Operators, Methods and Selection Rules, Keystroke-level Modeling

5. Interaction Styles: Command line interface, Graphical user interface, WIMP, Point-and-click, Drag-and-drop, Cursor, Widget, Direct manipulation interface, Desktop, WYSIWYG (What you see is what you get), Zooming User Interface

6. Interaction Paradigms: Hypertext, Hypermedia and Hyperlinks, Speech recognition, speech synthesis, natural language processing, non-speech audio input, Mouse gestures and Handwriting recognition, Haptics, telehaptics, Computer mediated

reality, Computer Supported Collaborative Work (CSCW), Ubiquitous Computing, Wearable Computers and cyborgs, Direct mind-computer interface

7. Interface Design Methods: User-Centered Design, Participatory Design, Value-sensitive Design, Rapid Prototyping, Interactive Design, User Scenario, Affordance Analysis, Scenario Based Design, Task Analysis / Task Modeling,

8. User Interface Engineering and Usability Engineering: Phases and Processes in User Interface Design – Functionality requirements gathering, User analysis, Information architecture, Prototyping, Usability testing, Wireframing, Layout and Graphic design,

Course Readings

Book

The text for the course is **Interaction Design: Beyond Human-Computer Interaction, second edition**, by Sharp, Rogers and Preece. The publisher is John Wiley & Sons, 2007. The website accompanying the book is at http://id-book.com.

Journals

Journals that deal with Interaction Design issues include:

ACM Transactions on Computer–Human Interaction	Human–Computer Interaction
International Journal of Human–Computer Studies	Behaviour & Information Technology

Academic Conference

- HCI International (http://www.hci-international.org/)

Annual held ACM's Conference on Human Factors in Computing Systems, usually referred to by it short name CHI (pronounced as kai, or khai).

- CHI 2011 (http://www.chi2011.org/)
- CHI 2010 (http://www.chi2010.org/)
- CHI 2009 (http://www.chi2009.org/)
- CHI 2008 (http://www.chi2008.org/)
- CHI 2007 (http://www.chi2007.org/)
- CHI 2006 (http://www.chi2006.org/)
- CHI 2005 (http://www.chi2005.org/)
- CHI 2004 (http://www.chi2004.org/)

MISM 643 Program Management and management Stratégies

Course Objectives
The course is designed to equip students with strategic Management Skills in the technology environment
Course outline

- Strategic Management, Strategy and Environment
- Corporate Strategy
- E-Business Models and Strategies
- Strategic thinking for management – introduction to game theory
- Technology Competition and Business, Managing innovation – technology strategy in theory and practice, Use of IT to gain competitive advantage.
- Strategic Technology Management. Information Technology's strategic role in organizations
- Program Management Principles & Practice

Electives:

651 Bio Informatics

Course Objectives

In this course, students will be introduced to the nature of biological data, its collection, curation, and analysis. Many of the tools required are common to other areas of analysis such as sampling, linguistics, classification. Some mathematical and statistical background is necessary as well.

Course Outline

1. Genomic information.

Prokaryotic and eukaryotic genomes, structure, organization and function; Molecular Evolution, Gene Structure, Genetic Codes and Mutation.

Biological Databases: Primary sources of sequence and structure data. Secondary databases.
Derived Databases
Large scale Gene Expression Data

2. Bioinformatics Basics

Sequence Analysis for Molecular biology. Overview of DNA and protein primary sequence analysis. Sequence Alignment – Scoring matrices. Local and Global alignment concepts – dynamic programming methodology. Statistics of alignment scores. Heuristic methods for database searching. BLAST and its statistical significance.

3. Pattern recognition and classification

Markov models for pattern detection. Hidden Markov models. Repeats. Phylogenetic analysis: Methods for Phylogenetic estimation: Maximum parsimony, Distance Matrix Methods and Maximum Likelihood Methods. Clustering methodologies: UPGMA, k-means, hierarchical clustering. Data imputation.

Course Readings:

1. David W. Mount (2001) Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Press

2. Warren Ewens and Gregory R. Grant. (2001) "Statistical Methods in Bioinformatics: An Introduction" Springer-Verlag

3. Waterman MS (1995) Introduction to computational biology: Maps, sequences and Genomes. Chapman Hall

652 Geo Informatics

Course Objectives

The course equips students to handle complex and powerful computerized geographical information systems (GIS). The course provides knowledge about the technologies supporting the processes of acquiring, analyzing and visualizing spatial data. The focus is laid on understanding of data collection, the ability to structure spatial databases and command of visualization techniques to display data output, as well as sound organizational infrastructure for managing and accessing the data.

Course Outline

Fundamentals: Principles of data capture, and use of aerial photographs and satellite imagery; Handling, integration, maintenance and geometric aspects of geodata; Methods of representing geodata, including the principles of internet application

Digital Photogrammetry and Remote Sensing: advances in airborne and spaceborne sensor systems; global positioning; digital photogrammetry; integrated up-to-date-capturing techniques
Digital photogrammetric workstations: primary data acquisition and sensors, and the perception of colour and depth; linear algebra and the theory of observations; photogrammetric systems and scanners; image processing platforms; orientation of images, and digital image enhancement; aerotriangulation and the use of GPS for control point positioning and field completion

GIS Operation: principles of computer programming; database concepts and development and DBMS Software tools; Creating and implementing databases; Managing and administering databases and the use of query languages; GIS Theory, Spatial analysis (network, raster and surface operations); Developing a GIS

application

Cartography and Geo-Visualization: The cartographic communication process, including commercial and management aspects; map type, symbol and typographical design and use of color; cartographic generalization and map protection; concepts and technical constraints of the cartographic production line; topographic mapping, and the production of large-scale maps and photo and image maps; thematic mapping, including socio-economic and physical environmental mapping, tourist maps, statistics and data classification; the visualization of multimedia ad web mapping applications.

653 Health Informatics

Course Objective

This class introduces students to the discipline of health informatics: its world context, its origins, its purposes and the nature of its current body of knowledge.

Areas of focus include:

- the role and use of ICT in health, healthcare and health related organizations;
- healthcare data and information;
- how healthcare information is currently captured, converted to machine language, stored and accessed.
- medical vocabularies and vocabulary systems such as the Unified Medical Language System
- standards for Electronic Health Records, such as Health Level 7 and the Good Electronic Health Record

Students will be exposed to various current applications of ICT to health information in areas such as e-health and telemedicine. Through case studies of working systems, students will gain an introductory understanding of health informatics.

654 Information assurance and security

Course Objectives

Information Security is becoming increasingly important in today's networked world and is impacting every aspect of society including finance, healthcare, government, education, arts and entertainment. The objective of this course is to teach the basic principles of information security from the perspective of providing security awareness and its best practices for the real world. Topics include motivation for security, tools and techniques used by adversaries to gather information and launch attacks, virus protection, secure credit card and bank transactions, wireless security,

computer forensics, identity theft and protection, anti-phishing and biometric security.

Course Outline

- Fundamental Concepts: Motivation for security, Basics of computer networks, Internet, Network tools and utilities.
- Introduction to Security Concepts: Threats and vulnerabilities in today's digital world; Security terminology, Common attacks.
  Hacker techniques: Gathering information, becoming part of a network, launching attacks, hacker tools.
  Securing a system: Firewalls, Safe web surfing
  Securing a transaction: Encryption, digital signatures, virtual private networks
  Cyber Crime: Internet fraud, Identity theft, Industrial espionage, Cyber terrorism
  Tools and Techniques for Security: Security hardware and software, intrusion detection systems, security standards.
  Emerging Areas: Wireless security, anti-virus and anti-phishing tools, computer forensics, biometrics, establishing security plans and risk mitigation.

Course Readings

Computer Security Fundamentals by Chuck Easttom, Pearson- Prentice Hall Publishers, 2006 edition, ISBN 0-13-171129-6
Additional references and web sites of interest will be given as and when appropriate.

655 Natural Language processing

Course Objectives

This course aims at introducing students to the area of Natural Language Processing that operates at the level of the large amount of text on the web. Statistical and probabilistic methods will be emphasized - along with the NLP fundamentals.

Course Outline

Words, Lexicon Design and Processing, Lexical Semantics Syntax, Parsing Techniques (Chart, ATN etc.), Probabilistic Parsers
Semantics, Knowledge Representation, Frames, Semantic Nets, Noisy Channel Metaphor, Hidden Markov Model and Associated Algorithms, Word Level Processing, Part of Speech Tagging, Parsing Techniques, Probabilistic Parsing, IR and Language Modeling, Corpus Technology, Lexical Knowledge Networks (Wordnet, Conceptnet, Framenet etc.), Machine Translation, question answering and Information Extraction, Indian Language Computing.

Course Readings

Books

1. Allen, James. 1995. Natural Language Understanding. Benjamin/Cummings, 2ed.
2. Charniak, Eugene 1996. Statistical Language Learning, MIT Press.

3. Jurafsky, Dan and James Martin. 2000. Speech and Language Processing. Prentice Hall.
4. Manning, Christopher and Heinrich Schtze. 1999. Foundations of Statistical Natural Language Processing. MIT Press.
5. Bharathi, A., Vineet Chaitanya and Rajeev Sangal. 1995. Natural Language Processing- A Pananian Perspective. Prentice Hll India, Eastern Economy Edition.

Journals

1. Natural Language Engineering, Computational Linguistics, Journal of IR, Journal of MT, IEEE Trans. on Data and Knowledge Engineering.

Conferences: SIGIR, ICML, ACL, EMNLP, HLT

656 Multimedia content management

Course Objective

The course focuses on developing and delivering multimodal content via digital media. The focus is on the principles of database design, interface development, usability testing and collaborative content management within technical communication settings.

Course Outline

- Introduction to Multimedia: Concepts of Multimedia, Multimedia Applications, Advantages of Digital Multimedia, Multimedia System Architecture, Objects of Multimedia
- Computer Graphics; Digital Audio; Digital Video
- Animation Theory and Drawing Basics
- Story Boarding and Script Writing
- Digital Compositing
- 2D Animation 3D Graphics Modeling Animation
- Creating Special Effects
- Designing Interactive Multimedia Applications
- Integrating Architectural Drawings with 3D
- Special Effects using Combustion
- Media Streaming
- Multimedia Databases

657 Information Industry and Entrepreneurship

Course Objective

Prepares students to start businesses in the information industry or to work effectively in new start-up businesses. Discusses aspects of creating a business and expects students to develop an idea into a business plan that could be used to either guide the creation of the business or secure funding for a new business

Course Outline

- Characteristics of an Entrepreneur. The Idea of an Entrepreneurial Venture.
- The Business Plan.
- Accounting for Business Plans. Projecting revenues, expenses and cash-flows.
- Financing the Business.
- Starting a Web / Software Business – E-Business.
- Competitive Analysis.
- Marketing and product development – Developing a marketing plan. High-tech marketing theories. The unique problems of marketing in a small business.

MISM 658 Knowledge Management

Course Objectives

The course teaches the essential principles of Knowledge Management.

Course Outline

- Introduction to Knowledge Management (KM) – Evolution of KM, Defining KM; objectives to knowledge management, Knowledge management perspectives, KM and the e-Business Space, Significance of KM.
- Knowledge and Learning – Defining Knowledge, Defining Learning, KM and Learning in Organizations, The Knowledge Hierarchy, Knowledge as a Strategic Resource, Types of Organizational Knowledge, Types of Knowledge acquired, KM and Individual Learning, E-Learning Characteristics, Essentials of E-Learning, Strategic Importance of E-Learning, Effectiveness of E-Learning
- Organizational Learning and Learning Organizations – Defining Organizational Learning, Organizational Learning Types, Levels of Organizational Learning, Motivation for Organizational Learning, Learning Organizations, Learning Strategies, Relationship of IT, IM and KM, Knowledge Sharing, Types of Knowledge Shared, Capturing and Sharing Knowledge, Examples from Private and Public Sector, Organizational Challenges
- Organizational Culture, Change Management and Communities of Practice
- Enabling Technologies – Requirements of Knowledge Workers, Mapping KM Technology to Transfer Modes, Technology issues, Layers of a KM Platform, Technology aspect of KM, Introducing the Intranet, Differentiating Intranet, Internet and Extranet, Intranet – Business Issues, Intranet - Technology Issues, Intranet - Components, Benefits of Intranet, Challenges and Opportunities of Corporate Intranet, Introducing Portals, Technology requirements of Portals, Enterprise Knowledge Portals, Content Management, Architecture of a CMS, Technology Challenges, KM Deployment Phases, Top 100 KM companies.
- Knowledge Management Framework and Processes – Knowledge Management Framework, Basics and requirements of Knowledge Framework, Knowledge Processes, Modes of Knowledge Generation, Knowledge Creation, IT Application

for Knowledge Creation, Knowledge Storage / Retrieval, Knowledge Repositories, Knowledge Transfer, Knowledge Harvesting

- Knowledge Strategy – Importance and Essentials of Knowledge Management Strategies, Codification, Personalization, Best Practices
- Knowledge Management Assessment and Planning – Knowledge Auditing, Need for Auditing Knowledge, Knowledge Audit Methods, Challenges for Auditing Knowledge
- Knowledge Management Measurements and Methodologies – Significance of KM Measurement, Types of Metrics, Analysis and Interpretation, The Measurement Process, Qualitative and Quantitative Measures, Balanced Scorecard.
- Building a Business Case for Knowledge Management

659 Enterprise Content Management

Course Objective

The course aims at providing solid understanding of ECM technologies and components to manage information through its lifecycle. The course covers technologies that helps you to capture, store, manage, preserve and / or deliver information in support of a business process.

Course Outline

- **What is ECM**: Definitions of ECM. Business Drivers – Costs, growth and risks. Current technologies. The ECM Roadmap – Capture, Store, Manage, Preserve, Deliver
- **Capture:** Structured and unstructured. Information sources. Information types.
- **Store**: Business model options. Security issues. Audit trails. Storage technologies. Repositories. Retention and disposal
- **Manage**: IM principles. Managing information. Managing content.
- **Preserve:** Preservation needs. Digital preservation techniques. Problems and Solutions
- **Deliver**: Browsing. Searching. Rendering. XML and personalization. Security aspects. Delivery channels. Publishing
- **Repurposing**: Content re-use. Challenges of re-purposing. Interoperability. Web publishing.
- **Metadata and Indexing**: Metadata. Standards and guidelines. Metadata types. Metadata sources. Metadata usage. Auto-classification and auto-indexing.
- **Classification:** Approaches. Classification schemes. Documents vs. Records.
- **Controls and Security**: Administration. Integrity. Authenticity. Access to sensitive records. Interoperability and openness. Compliance requirements. Virus protection.
- **Interfaces and legacy systems**: Linking systems. Interfacing. Migration. Delivery channels.
- **Success Factors**: User awareness. People roles. Supplier capability. Timescales and planning.

661 Pattern Recognition and Image Processing

Pattern recognition systems

Course Objective

The course is designed to introduce students to theoretical concepts and practical issues associated with pattern recognition.

Course Outline

- **Model based pattern recognition** : Mathematical models of the three-dimensional recognition from depth images, three-dimensional recognition from intensity images and two-dimensional recognition from intensity images. Model based recognition problems. Computational strategies.
- **Structural pattern recognition :** Features selection and extraction. Constraints. Model and scene representation. The exact matching.Search space. Exhaustive matching methods: Graph isomorphism methods. Relaxation methods. Transforms classifications. Search space reduction methods: Tree search. Hypothesis generation and checking.
- **Intermediate representation.**
- **Inexact matching.**
- **Knowledge based recognition**

Textbooks and references

1. Richard O. Duda, Peter E. Hart , David G . Stork, "Pattern Clasification", John Wiley and Sons, 2001
2. W.E. Grimson, " Object Recognition by Computer: The Role of Geometric Constraints", MIT Press, 1990.
3. S. Nedevschi, "Prelucrarea imaginilor si recunoasterea formelor", Ed. Microinformatica, Cluj, 1997.

Image processing

Course Objective

The course is designed to introduce students to theoretical concepts and practical issues associated with pattern recognition.

Course Outline

- **Computer vision and applications**. Vision systems structure and functions.
- **Image acquisition systems**. Image formation and sensing. Camera model.
- **Stereo-vision basics**. Epipolar geometry. Depth computation.
- **Image data representation.**

- **Binary image processing** : Single object: geometric properties from image, geometric properties from run-lengths encoding, Multiple objects: connected components, labeling algorithms, contour tracking, and contour approximation.Mathematical image morphology, distance transform, medial axis, thinning.
- **Grayscale image processing** : Mathematical methods for grayscale image processing: Convolution, Fourier transform. Statistic features of the grayscale images. Histogram processing. Noise in grayscale images. Image enhancement: spatial domain methods, frequency domain methods, geometric transformations. Image blurring and sharpening.
- **Grayscale image segmentation** : Region based segmentation: threshold methods, texture based methods. Region growing, region splitting and merging, Wathershading. Edge based segmentation: first order differential methods, second order differential methods. Edge linking, contour closing, contour approximation by straight lines. Hough transform.
- **Color images**. Color models. Color based segmentation.

Textbooks and references

1. R.C.Gonzales, R.E.Woods, "Digital Image Processing-Second Edition", *Prentice Hall, 2002.*
2. E. Trucco, A. Verri, "Introductory Techniques for 3-D Computer Vision", *Prentice Hall, 1998*
3. R. Haralik, L. Shapiro, "Computer and Robot Vision", *Addison Wesley, 1993*.
   I. Pitas, "Digital Image Processing Algorithms", *Prentice Hall, 1993*.
   Y. Shirai, "Three-dimensional Computer vision", *Springer-Verlag, 1987*.
4. S. Nedevschi, "Prelucrarea imaginilor si recunoasterea formelor", *Ed. Microinformatica, 1997.*

662 Computer Graphics

Course Objective

Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms.

Course Outline

- The graphics pipeline: Getting with OpenGL. Interactive Graphics.
- Graphics Primitives: Lines, Circles, Polygon Filling, Windows and viewports
- Clipping: Line Clipping. Polygon Clipping.
- Affine Transformations
- Scan conversion algorithms
- Hidden object detection

- Illumination and shading models
- Color concepts
- Graphics APIs and hardware
- The effects of graphics on society

663 Text Mining

Course Objectives

This course aims to give students an understanding, both at the conceptual and the technical level of the development of NLP applications in the text mining / information extraction area. At the conceptual level, the course introduces machine learning as a powerful generic toolbox for automatically learning NLP modules from data. At the technical level, the course offers hands-on training and experience in building an actual text mining application in which NLP modules contribute to extracting information from text.

Course Outline

1. Introduction to Text Mining and Computational Linguistics, Machine Language algorithms and language data: The nature of unstructured and semi-structured text. Text Classification. Exploiting text-specific features. Feature selection. Evaluation of classification. Part of Speech tagging. Micro and macro-averaging.

2. The process of structuring the text. Parsing. Derivation of linguistic features. Text categorization. Text Clustering. Concepts / entity extraction. Sentiment analysis. Document summarization and entity relation modeling.

3. Text encoding: tokenization, stemming, lemmatization, stop words, phrases. Further optimizing indices for query processing. Proximity and phrase queries. Positional indices.

4. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Blocking. Extreme compression.

5. Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

6. Probabilistic models for text problems. Classical probabilistic IR. Language models. Naïve Bayes models. Spam filtering.

7. Clustering. Introduction to the problem. Partitioning methods. k-means clustering. Mixture of Gaussians model. Clustering versus classification. Hierarchical agglomerative clustering. Clustering terms using documents. Labeling cluster. Evaluating clustering. Text specific issues. Reduced dimensionality / spectral methods. Latent semantic indexing (LSI). Applications to clustering. Text categorization.

8. Text Mining Software: PreText (http://www.icmc.usp.br/edsontm/retext/) An environment for pre-processing text for Text Mining; UMIA standard

(http://www.research.ibm.com/UIMA/) - integration framework for text technologies including text mining; The "Ultimate Research Assistant" (http://www.hoskinson.net/ultimate.research.assistant/) - an online text mining tool; GATE (General Architecture for Text Engineering) (http://gate.ac.uk/) - freely available open-source Java library for text engineering and a leading toolkit for text mining, information extraction, and other natural language processing tasks; YALE (Yet Another Learning Environment (http://yale.sf.net/)) - freely available integrated open source software environment for knowledge discover, data mining including text mining, machine learning, visualization (e.g. of text clustering); Bow (http://www.cs.c.u.edu/mccallum/bowl/) - freely available open source toolkit for statistical language modeling, text retrieval, classification, and clustering; Topicalizer (http://www.topicalizer.com/) - an online text analysis tool for generating text analysis statistics of web pages and other texts; Textalyser (http://textalyser.net/) - an online text analysis tool for generating text analysis statistics of web pages and other texts.

664 Cultural Informatics

Course Objectives

The course aims at promoting scientific knowledge and research in the field of Cultural Informatics

Course Outline

- Digitization of Collections. Museum Information Systems. Virtual Exhibitions. 3D Modeling and Animation.
- Museum Education: Digital Media in Museopedagogics.
- Digital Applications for the Display of Exhibits. Cultural Heritage Topics. Digital Art Topics and Modern Identity Perspectives. Cultural Economics. Cultural Representation. Graphic Design. Interface Design. Cultural Design.

665 eGovernance

666 E-Learning

667 Financial Information Systems

668 Multilingual Information Management

Course Objective

This course is a logical sequel to MISM657 (which is the prerequisite for this course) and aims to take into account the special requirement of processing textual information in the Indian context, which has tremendous language diversity. The main focus of the course will be cross lingual information retrieval and shallow processing of Indian languages.

Course Outline

Morphology of Indo-Aryan and Dravidian Language Streams, Stemmers and Morphology Analysers, Part of Speech Tagging for Indian Languages, Local Word Grouping, Machine Translation Overview, Indian Language Wordnets

IR overview, Cross Lingual Information Retrieval (shallow semantics), CLIR (deep semantics), Indian Language Search Engines

Summarization, Question Answering, Natural Language Generation

Course Readings

This area is a very upcoming domain. Papers from IR, NLP and MT journals and conferences will be used. Some noteworthy fora are ACL, SIGIR, CLEF, TREC, CoNLL, MT Summit, Journal of MT, Journal of IR etc.